USING LABORATORY EXPERIMENTS TO BETTER UNDERSTAND VOLUNTARY CONTRIBUTIONS

A Dissertation

by

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ABSTRACT

This dissertation covers three papers concerning voluntary contributions. There are competing theories as to why individuals contribute to projects which help others (e.g., charities); many of the theoretical models have at their core, that an individual is indifferent between giving time or money. We test this assumption in a laboratory (and other related phenomena concerning giving time and money to charity). Further, we test how individuals react to third-party information regarding charities. This is to help understand what impact, if any, a group's (e.g., Charity Navigator) positive rating of a charity has on the likelihood an individual will give to that charity. This question is important because it is often costly for a charity to become rated and there is no consensus that being rated will improve the donations they receive. A final paper studies a situation where individuals give to projects which help others that are not (normally) charities. These are government programs which improve the welfare of future generations (e.g., cleaner environment or education). In this context, I still study the voluntary contribution to such projects as opposed to compulsory contribution via taxation.

The findings of this dissertation are, broadly, that there is a differential treatment of giving time and money to charity with individuals more willing to give larger amounts (in value) of time to charity. This document presents potential explanations which traditional economic models have ignored for this outcome. Additionally, the research shows that individuals have very small preferences for local charities when donating. This finding is important because our analysis controls for the impact of third-party evaluations of charities, which would naturally depress local giving. Even when positively rated by a third party, individuals were not statistically influenced

to select a local charity; rather, past experience with a charity was most important for determine current donative behavior. Lastly, this dissertation investigates intergenerational public goods. Specifically, does debt financing increase the production of public goods and the impact on dynamic welfare. I find that future welfare is harmed when debt is used to finance these goods. There are multiple explanations for this outcome, the most likely being the intergenerational moral hazard problem.

DEDICATION

To the family who supported me, faculty at Hendrix College who started me on this *Odyssey*, friends who offered encouragement and understanding, and Texas A&M faculty who advised me — thank you all. This undertaking was possible due in large part to your involvement in my life.

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1. VOLUNTARY CONTRIBUTIONS: A BROAD INTRODUCTION

Individuals often voluntarily give time and resources to others. Understanding what factors compel them to do so has become a central question of behavioral economics. Many models to have been developed within the a sub-field of other-regarding preferences the concept that individuals gain happiness, not just from their own direct consumption of resources, but also from the consumption of resources by others. These research agendas have proposed a myriad of reasons for individuals to give resources to others. Individuals may care about equity, guilt and envy, the prestige they get for helping others,Rawlsian concerns, reciprocity, or evolutionary motivations. Another motivation for aiding others is internalizing happiness from the explicit cost to one's self of aiding others — economists call this warm glow. Warm glow implies that individuals gain utility for the act of helping others. While I argue that none of these motivations to give to others/group projects invalidates the other, I will focus primarily on the concept of warm-glow preferences as it relates to voluntary contributions which aid others.

Chapters II and III of this document focus on voluntary contributions to charitable organizations. Chapter IV discusses voluntary contribution to a modified version of a traditional public good whose benefits extend to other players besides those who currently can fund it.

Specifically, Chapter II investigates the relationship between gifts of time and money to charity. The literature in economics has treated these two gifts as being perfect substitutes; individuals are indifferent between giving one-hundred dollars in value of time and writing a check for one-hundred dollars to a charity.[1] We find

[1]We define the value of an individual's time as their opportunity cost determined by their wage rate from labor market activity. For instance, if an individual earns twenty dollars per hour, the

that the two gifts are not treated the same by individuals; individuals would rather donate time than money. We further find that the two goods are, on aggregate, substitutes for one another. They are not, however, perfectly substitutable as neoclassical theory predicts.

Chapter III asks how individuals respond to information about charities. Specifically, when presented with information about how a third-party (e.g., Charity Navigator) evaluated a set of charities do subjects respond by selecting charities which are more favorably rated? Subjects perform an effort task to earn money and can choose to donate to their selected charity. We find evidence that subjects' choice of charity is impacted by third-party evaluations but, somewhat surprisingly, there are no obvious preferences for local charities. These third-party assessments have some impact on the percent of earnings that subjects allocate to their selected charity; local charities also accrue more donations, though these results are somewhat imprecise.

Chapter IV deviates from the previous two chapters in that its focus is not on charitable giving; contributions to an intergenerational public good and the use of debt financing are the primary focus. The contributions to the public good are still voluntary. This chapter presents research which seeks to understand when debt-financing services and goods by government is optimal and to test if individuals can in fact behave optimally in these conditions. I find that adding debt-financing as a means of funding the public good increases contributions to the project which yields higher endowments for future agents. These gains are, however, offset by debt repayment so that economic growth is not possible for future generations without additional debt.

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opportunity cost of two hours of her time is forty dollars. Therefore, the traditional literature in economics assumes that she would be indifferent between volunteering for five hours and writing a check for one-hundred dollars to the same charity.

2. UNDERSTANDING VOLUNTARY CONTRIBUTIONS OF TIME AND MONEY TO CHARITY

Most non-profit organizations rely on donations of both money and time—that is, volunteering. Though both types of donations are common,[1] most of the literature on this topic addresses aspects of monetary donations. In most charitable giving models, a sophisticated altruistic donor maximizes the benefit of her donation to the organization subject to her personal costs. For instance, when a consultant whose hourly rate is $100 donates her time at a local soup kitchen, it is unlikely that the kitchen is getting $100 worth of increased service provision, yet this was the opportunity cost of the donation. The charity would be better served if the consultant had worked an extra hour and donated her extra salary to them. Further, her opportunity cost would have been identical.

The experiments in this paper are largely inspired by the observation that many high earners do, in fact, volunteer their time.[2] Our hypothesis is that this phenomenon is driven, at least in part, by higher levels of warm glow when donating time and effort than when donating money. Our experimental design controls wage rates and tasks to directly test whether individuals gain different levels of utility

[1] In 2010, approximately 8.1 billion hours of volunteering were provided in the United States [Corporation for National & Community Service, 2011] with an estimated market value of nearly $173 billion. Total monetary gifts to charitable organizations were $291 billion [Giving USA Foundation, 2011].

[2] For example, data from the 2011 American Time Use Survey shows that, among full-time workers over 25 years of age, volunteer rates are similar across quartiles of the earning distribution, with the 4.9% of the bottom quartile volunteering an average of 2.15 hours on the day the time diary was collected, conditional on volunteering, and the 5.2% of top quartile volunteering an average of 2.14 hours [United States Department of Labor, 2010]. Additionally, the 2010 Study of High Net Worth Philanthropy [Center on Philanthropy at Indiana University, 2010], surveying individuals with household incomes over $200,000 and/or a non-residential net worth over one million dollars, found that nearly 80% of these individuals with volunteered in a given year, with half that number volunteering over 200 hours.

from donating money to charity and working an equivalent amount directly for charity. Our main result is that subjects are more likely to donate (extensive margin) and give more (intensive margin) when working directly for the charity than when working for themselves and then later donating their earnings to charity.

Our results naturally extend to and inform the broader literature on non-monetary gift giving. That literature suggests non-monetary gifts are favored due to their superior signaling properties [e.g., Camerer, 1988, Waldfogel, 1993, Prendergast and Stole, 2001, Ellingsen and Johannesson, 2011]. We find that individuals show a preference for non-monetary giving without any such signaling available, suggesting that other mechanisms may be at work as well—namely, differential warm glow.

The experimental laboratory is an appropriate environment for examining our primary research question. Subjects perform *identical* tasks for charity or themselves, ruling out working for charity due to heterogeneous ability or convex preferences over tasks. It is unlikely that an experiment could feature this level of control in the field. One potential issue is that the nature of our experiment requires offering individuals the choice to volunteer throughout the task; it is therefore plausible that the volunteering condition features a greater level of solicitation. Then it is greater solicitation—not greater warm-glow from working directly for charity—that is responsible for our main result. To address this concern, we compare our volunteering condition to three separate conditions all with varying levels of solicitation. In the most extreme case, subjects have the opportunity to give to charity for the entire experiment, the equivalent duration of the volunteering condition. Thus, our experiment also features a secondary research question: the effect of solicitation on charitable giving.

To examine the effects of solicitation, the experiment includes three conditions that allow subjects to give earnings to charity under varying levels of solicitation. To

investigate our primary research question, we compare the results of these monetary donation conditions to two that allow subjects to volunteer directly for charity. In the baseline, "Donate at End," condition, subjects earn money first and then decide how much to donate. This setting is the stylized version of the standard monetary gift to charity. Having established this baseline, we add a simple reminder that subjects will have the opportunity to donate to their pre-selected charity at the end of the experiment (we refer to this as "non-actionable solicitation" and to this condition as "Continual Reminder"). Another condition allows subjects to donate any part of their earnings at any time during the experiment ("actionable solicitation," and the "Continual Donation" condition). Finally, we allow subjects to choose to earn money for themselves or *directly* for charity (we refer to this as the "Toggle" condition, since subjects can switch back and forth between working for themselves or charity easily); this condition is a stylized version of volunteering. Our last condition is a combination of Continual Reminder and Toggle; a subject is able to earn money for herself or her selected charity and knows she will have the option to donate any of her personal earnings to charity at the conclusion of the effort task. Within this condition, we vary the relative wages or the two accounts and have four wage pairs.

As with others [e.g. Andreoni et al., 2011, Meer and Rosen, 2011, DellaVigna et al., 2012] who find evidence of the power of solicitation, we find that the Continual Donation condition attracts more donations, though not necessarily larger ones, than our non-actionable Continual Reminder condition, which in turn is not greatly different than the baseline Donate at End condition. We therefore conclude that non-actionable solicitation in the form of subtle reminders has no impact on donative behavior in our environment. Actionable solicitation, however, does have an impact. The increases in donations are mainly driven by more subjects choosing to donate (extensive margin) and not by an increase in giving behavior among givers

(intensive margin).

These additional forms of solicitation do not fully explain the differences across conditions. When working directly for charity in the Toggle condition, subjects are more likely to give and give substantially more on every dimension (including conditional on making any gift) than in any of the other monetary donation conditions. The differential results in Toggle are most striking when compared to Continual Donation which, as described later, effectively allows subjects to produce identical donation patterns as in the Toggle condition.

When subjects are given the ability to give both time and money to a charity they select, in conditions we call "Toggle + Continual Reminder," they tend to donate more in the form of time, even when the wages for oneself are 33% larger than those for the charity. We interpret these findings to be a rejection of a prediction that agents only care about the value of their donation, and not the way it was donated. Our findings are consistent with a model of charitable giving where volunteering produces more warm glow than monetary donations.

We argue the that differential warm glow is best explanation for our aforementioned experimental findings. In Section 2.5, we examine several alternative explanations that might explain our results. None are consistent with the data observed in our experiment.

Of course, volunteering activities in the field have a number of attributes that are different from work. When an individual volunteers for charity, she may see the grateful faces of others, receive greater recognition for her contribution, make valuable social contacts, or perform a task so different from her work that she may view it as leisure. We readily concede these issues. However, the fact that we find an effect at all in this environment strongly supports the idea that an individuals' preference to volunteer results from more than just these factors. One may argue—

though it is not necessary to interpret our main results—that if anything, because these features *increase* the utility individuals receive from volunteering relative to donating money in the field, our results likely to be a lower bound for the preference for volunteering.[3]

The remainder of our paper is organized as follows: In Section 2.1 we present the relevant literature. Then, Section 4.2 presents the theoretical framework. Section 4.3 discusses our experimental design and our predictions. Section 4.4 presents our results, with Section 2.5 presenting alternative explanations for our main results. Section 2.6 closes our paper with a brief discussion of our work and concluding remarks.

2.1 Literature

The charitable giving literature discusses warm glow, prestige, reciprocity, fairness, social pressure, and impact philanthropy as potential explanations for the prevalence of pro-social activity. A detailed discussion of the economics of philanthropy is presented by Andreoni [2006]. None of these theories invalidates another and each likely underlies some important aspect of individual behavior. For the purpose of our paper, we focus on warm glow and solicitation as the primary reasons for giving, since our experimental design normalizes many of the other factors which could drive pro-social behavior.

Andreoni [1989] lays out a model in which an agent gains utility from the act of donating, a phenomenon dubbed "warm glow." A number of recent experiments have documented the extent to which warm glow drives giving. Crumpler and Grossman [2008] show that agents will give some of their own money to charity even when their

[3]Alternatively, the ability for higher earners to deduct donations on their tax returns, which are not present in our experimental environment either, might give individuals a preference for monetary donations in the field through a lower price of giving.

donation does not alter the total amount donated to charity. That is, individuals are giving for pure warm glow reasons, not to expand the amount available to the charity. Tonin and Vlassopoulos [2010] finds similar influences of impure altruism. Null [2011] suggests warm glow may be partially to blame for inefficient allocations of gifts to charity.[4] Taken together, these studies indicate that warm glow is a key factor in both charitable activities.

Solicitation has an important impact on donor behavior, making potential donors more likely to donate [Andreoni et al., 2011, DellaVigna et al., 2012, Meer and Rosen, 2011]. While most papers on this subject have focused on the charity's choice of fundraising strategy and its reaction to grants [e.g., Andreoni and Payne, 2011], Landry et al. [2006] investigate different solicitation approaches and their impact on giving, and find that individuals are much less likely to given in response to direct mail than to a door-to-door solicitation, but conditional on giving, make larger gifts.

Though not as often studied, volunteering is a key segment of the non-profit industry. The literature on the relationship between volunteerism and monetary donations consists of theoretical, empirical, and experimental approaches, but even with the various techniques there is no consensus on whether volunteering is a substitute or a complement to a monetary donation. Duncan [1999] develops a model showing that agents should be indifferent between giving time or money to charity in equilibrium. Brown and Lankford [1992] assume that giving is a normal consumption good and use survey data and jointly estimate giving functions of time and money, finding that gifts of time and money are complements. Likewise, Apinunmahakul et al. [2009] conduct similar analysis with a later and larger survey data and find similar results. Conversely, Bauer et al. [2012] use repeated cross-sectional European survey data;

[4]The observed inefficient allocations in his study are driven by failures to adequately adjust to different exogenous donor matching rates.

they do not find that donations of time and money are gross complements. Feldman [2010] uses a well-specified utility function to build an econometric model and, using national survey data, shows that the two types of gifts are substitutes.

Liu and Aaker [2008] conducts a set of different experiments which indicate that asking subjects to give time to a charity makes them more likely to connect emotionally with the charity's cause and then give when asked later. Pfeffer and DeVoe [2009] use a set of questions to highlight that individuals whose income was based on hourly rate are less willing to volunteer.[5] To better understand how individuals value their trade-off of time and money, Ellingsen and Johannesson [2009] design an ultimatum game experiment in which people played with either time or money; they find subjects are more willing to incur non-monetary sacrifices than monetary ones but leave it as further research to ask why that happens.

Concurrent with our work, Lilley and Slonim [2013] conduct a laboratory experiment which offers insights into impure and pure altruism. Subjects make choices about how time and money they would like to donate to charity while facing different match rates, wages, tax rates, and endowments; one of these choices is then implemented. They additionally vary how the value of these donations is phrased in order to induce a focus on pure or impure altruism. Their results, which are complementary to ours, find that subjects are willing to sacrifice efficiency in their giving in order to increase their own utility.

2.2 Theoretical Model

We employ a theoretical approach which offers testable implications on how agents view donations of time and money. Duncan [1999] shows that under relatively mild conditions agents should be indifferent between donations of time and

[5]Further, if individuals are are made to calculate their approximate hourly wage, then they are also less willing to volunteer.

money to a charity that provides a public good. We employ a modified version of the a warm-glow utility function found in Andreoni et al. [1996].[6]

$$U = U(x, d, v, l; s, w, w') \tag{2.1}$$

subject to

$$x + d + wv + wl = wT \tag{2.2}$$

where w is the earned wage rate, w' the imputed wage of charitable activity, $x \in \mathbb{R}_+$ personal consumption, $l \in \mathbb{R}_+$ leisure, $d \in \mathbb{R}_+$ the amount of money donated, $v \in \mathbb{R}_+$ the time volunteered, T the endowment of time and s is an exogenously given state which captures the level(s) of solicitation. The term w' is the price the charity would have to pay to have the service provided in the absence of an agent volunteering to do it. As pointed out in Andreoni et al. [1996], it is likely the case that $w' \leq w$. We assume the utility function is continuous, quasi-concave, and all cross-partials are zero. Utility increases choice variables in the utility function. We assume that utility is not increasing in solicitation.

A specific functional form which matches these criteria is

$$U(x, d, v, l|s, w, w') = x + z(l) + \alpha_1(d) + \alpha_2(vw) + F(d + vw') + h(d + vw - s) \tag{2.3}$$

Functions $\alpha_1(\cdot)$, $\alpha_2(\cdot)$, and $F(\cdot)$ represent warm-glow accruing to the agent from donating money, volunteering, and the additional utility received based on the charity's value of one's gift, respectively. We assume that $z(\cdot)$, $\alpha_1(\cdot)$, $\alpha_2(\cdot)$, and $F(\cdot)$ are well-behaved concave, continuous, nondecreasing, and differentiable functions similar to Andreoni et al. [1996] whereas $h(\cdot)$ is continuous, nondecreasing, and concave.

[6]We remove tax rates from the model and add a parameter for solicitation.

The first order conditions for the two donation variables yield

$$d : -w + w\alpha_1'(\cdot) + wF'(\cdot) \geq 0 \tag{2.4}$$

$$v : -w + w\alpha_2'(\cdot) + \tilde{w}F'(\cdot) \geq 0. \tag{2.5}$$

This structure on $h(\cdot)$ is similar to that of DellaVigna et al. [2012] when investigating the effects of solicitation on giving. A direct implication of the model is that increased solicitation will never decrease gifts to charity.[7]

Proposition 2.1 (Nondecreasing Returns to Solicitation) *Suppose* $s' > s$ *and* (x^*, d^*, v^*, l^*) *maximizes* $U(x, d, v, l|s, w, w')$ *and* (x'^*, v'^*, d'^*, l'^*) *maximizes* $U(x, d, v, l|s', w, w')$. *Then* $v^*w + d^* \leq v'^*w + d'^*$.[8]

Our central line of inquiry is the relationship between α_1 and α_2. The conventional assumption is that these two functions are equal [Andreoni et al., 1996, Duncan, 1999].

Assumption 1 *For all* d, v, w, *if* $d = vw$, *then* $\alpha_1(d) = \alpha_2(vw)$.

Simply stated, Assumption 1 states that an agent's warm glow from giving money or giving time to a charity is the same if the sacrifice to the agent is the same. This assumption, however, does not directly imply an agent is indifferent between giving time or money to charity. Since it is likely that $w > w'$, agents value their own volunteered time more highly than the charity does. Agents also gain utility from the actual value of their gifts to charity, seen in the term $F(\cdot)$; therefore, the value

[7]There is some evidence which suggests that over-solicitation can lead to decreased giving [Diamond and Nobel, 2001]. It seems unlikely that our environment has large enough levels of solicitations to warrant that concern.

[8]Proofs of all Propositions are available in the mathematical appendix.

of monetary gifts should be greater than the value of volunteerism. We develop a proposition that addresses whether the majority of gifts are from time or money.

Proposition 2.2 *Provided some form of donations occur ($d + vw' > 0$), the relation between wage rates (w and w') determines the optimal allocation of gifts. Specifically, agents donations (either in time or money) favor the method with the higher wage rate. That is,*

1. *If $w > w'$ then $d > vw'$.*
2. *If $w < w'$ then $d < vw'$.*
3. *If $w = w'$ and $\alpha_1(\cdot)$, $\alpha_2(\cdot)$ are non-linear, then $d = vw'$.*

Thus, if effective charitable wage is higher than the wage rate, a majority of gifts should come from volunteering. If the opposite occurs, the majority of gifts should be from monetary donations. If the wages are equal, donations will be equal, unless both donations are perfect substitutes.

Proposition 2.2 provides an immediate corollary which is of interest when only one type of donation (either time or money) is possible.

Corollary 2.1 *Suppose that, in one state, monetary donations are restricted so $d_1 \equiv 0$ and in another state, volunteering is restricted so $v_2 \equiv 0$. If all other parameters are equal across states, then total donations across environments are equal. That is, $v_1 w_1' = d_2$.*

Corollary 2.1 tells us that an equivalent statement of Proposition 2.2, Point 3, holds when comparing across theoretical environments.[9] If wages are equal across two

[9]It is a simple mathematical exercise to verify that Points 1 and 2 will also hold across such theoretical environments.

environments—one where only volunteering is possible and one where only monetary donations are possible—then donations should be equal. Unlike Proposition 2.2, part 3, Corollary 2.1 will hold regardless of the functional form of α_1 and α_2.

The case where α_1, α_2 are linear is a special case of the theoretical model. Since $\alpha_1 = \alpha_2$ by Assumption 1, the marginal utilities of each good are always equal and donations of time and money are perfect substitutes. Under these conditions, if $w > w'$, $d > vw' = 0$; if $w < w'$, $vw' > d = 0$. If $w = w'$ any donative activity where $d + vw' = K$ produces identical utility at identical costs, so we cannot put any conditions on d and vw' in such case.

This special case is important when comparing environments where an agent has only one type of donation available to an environment where she has both types available. Basically, unless we have this special case, there should be a greater total donation where both types of donations are possible.

Proposition 2.3 *Giving in an environment with at least two methods of gift donations is at least as high as giving in an environment where only one method of giving is available. Further, the two are only equal if and only if α_1, α_2 are linear.*

This theoretical environment generates testable implications regarding the allocations of both types of gifts (Proposition 2.2 and Corollary 2.1), two- versus one-gift environments (Proposition 2.3) and levels of solicitation (Proposition 2.1). In the next section, we explain our experimental design and then discuss, in Section 2.3.4, the specific predictions that these Propositions produce in this experiment.

2.3 Experimental Design

All experiments took place at the Economic Science Laboratory in the Department of Economics at Texas A&M University. 414 undergraduates were recruited from econdollars.tamu.edu, an ORSEE [Greiner, 2004] website database.

The experimental design features the five conditions mentioned previously: Donate at End, Continual Reminder, Continual Donation, Toggle, and Toggle + Continual Reminder, described in the next sections. The Donate at End and Toggle conditions are designed to compare the choice between working and then donating to charity against the option to volunteer for charity. Continual Reminder and Continual Donation help to ascertain whether actionable and/or non-actionable solicitation can explain any part of the difference in results between the two conditions. The Toggle + Continual Reminder condition allows us to investigate the robustness the comparisons between Toggle and the other, monetary gift only conditions.

In each condition, subjects performed the same effort task over identical lengths of time and faced the same list of charities with the order randomized for each subject. Subjects earned all money they donated to charity rather than receiving it as an endowment; this design allows for a clearer comparison to our conditions where subjects can choose to work directly for charity and may also more accurately model outside behavior.[10]

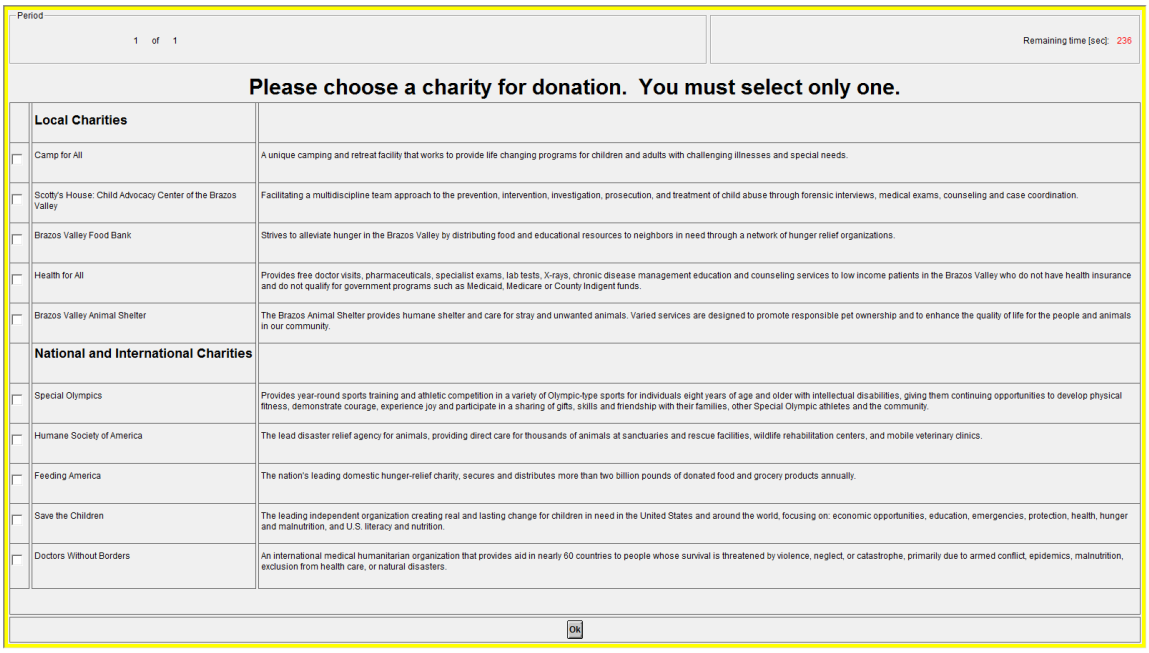
2.3.1 Charity Selection

Subjects were informed they would have to select one charity from a menu of ten charities and corresponding descriptions. Charities were randomly sorted on the screen into one of two different menu styles, organized either by location (local v. national) or by type of charity (e.g. food security, special needs, etc.). The order of the relevant categories was randomized, as was the order of charities within each category. This random sorting was done to help assuage any concerns of anchoring effects from specific menus. An example menu can be seen in Figure 2.1. Subjects

[10]Reinstein and Riener [2012] show there are large differences in donation behavior when subjects are endowed with money rather than earning their endowment. They find that those subjects who earned their compensation choose to donate less.

were given four minutes to review the options available to them and select their charity.[11] Each subject knew that her choice was finalized once selected and understood that selection of a charity did not require compulsory contribution to it. After all subjects selected a charity, the experiment would proceed.

Figure 2.1: Sample Charity Selection Menu by Location



For the purposes of examining another hypothesis, some subjects were given information detailing if the charities were approved by either the State Employee Charitable Campaign of Texas or were three or four star rated by Charity Navigator during the charity selection process [Brown et al., 2014]. The information was provided independent of condition and did not greatly affect the results.[12]

[11] This process rarely took more than two minutes.

[12] Indicators for the interaction of our baseline conditions with these information-provision conditions were not jointly or individually statistically significant, whether entered separately for each rating organization ($p = 0.31$) or together ($p = 0.97$).

2.3.2 Effort Task and Payment Schedule

The effort task began after all subjects had selected their charity.[13] Subjects had 75 minutes to move as many "sliders" from one position on the screen to a specific randomized target (see Figure 2.2) as they could.[14] In all conditions except Toggle + Conditional Reminder, subjects were told they would be paid \$0.03 per slider completed in addition to a participation award of \$5.00.[15] For the Toggle + Continual Reminder condition were told the amount of money per page of sliders they would be awarded in addition to the \$5.00 participation award. We used three primary wage pairs $(w_{Individual}, w_{Charity})$: (\$0.03, \$0.03), (\$0.03, \$0.04), and (\$0.04, \$0.03), along with a fourth, (\$0.035, \$0.035), to test for income effects.

Subjects moved their slider markers along the line to a randomly generated target number (an integer in the set $[1, 99]$), with the slider beginning at the far left at the point corresponding to 0. In Figure 2.2, the target position is located at 73 and the subject's current position is at 63. Once the subjects aligned their markers, they (or their charity, if applicable) were credited the appropriate wage and they were able to move to another slider.

Figure 2.2: An Example Slider

[13] In the Toggle condition, subjects were first asked to select if they wished to start working for charity or themselves.

[14] This task was developed by Gill and Prowse [2012].

[15] Subjects were not permitted to give their participation award to charity.

The subject saw thirty sliders (10 rows of three) on the screen and could complete the sliders in any order; once all thirty sliders were finished, the page reset with thirty more sliders and newly randomized target numbers for each slider. This process repeated throughout the experiment until the time expired, providing no upper bound on the amount of money subjects could earn. Subjects who did not wish to participate in this task for the full length of time were allowed to browse the internet. An earnings summary and the time remaining were displayed at the top of the screen, and subjects were given a verbal notification when two minutes remained and when thirty seconds remained.

Subjects were paid individually and discretely in cash at the conclusion of the experiment to avoid any social stigma from their earnings and donation selection. Subjects were presented two envelopes; one envelope was unlabeled and contained their personal earnings while the second was labeled with the charity's name. If a subject chose to donate money to charity, the second envelope would contain that amount of money. Each subject was asked to confirm that these amounts were correct and sign a form stating that they wished to contribute their charity total to the charity whose name was on the envelope. The experimenter then collected the charitable envelope from the subject, taped it shut, and placed the envelope in a box labeled donations. Subjects were informed that all donations would be made within 90 days and were given contact information for the experimenter making the donation. Donation totals for each charity were calculated, and a donation in that amount was given to each charity at the conclusion of all the sessions.

2.3.3 Experimental Conditions

The experimental design made use of five conditions to determine the effects of donations of time versus money and solicitation. The Toggle condition provided

subjects an opportunity to work directly for charity. Donate at End, Continual Reminder, and Continual Donate comprise our three monetary-donation-only conditions. Those conditions gave subjects the opportunity to donate money to charity under different types of solicitation (minimal, nonactionable, and actionable, respectively). Our final condition allowed subjects to give both time and money; it is a combination of Toggle and Continual Reminder. Within this condition, we varied the relative wages of working for self or charity.

2.3.3.1 Donate at the End (DE)

The Donate at the End (DE) condition is the standard environment in which agents work for themselves, receive their pay, and then make a donation to charity. Subjects were informed at the beginning of the experiment that they would have the option to earn money and give any portion of their earnings to charity at the end of the time allotted.[16] Once the effort task ended, subjects were reminded which charity they selected at the beginning of the experiment; they then decided how much of their earnings to donate to that charity.

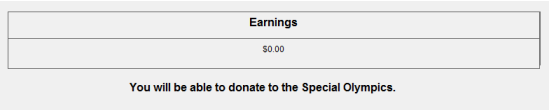
2.3.3.2 Continual Reminder (CR)

The Continual Reminder (CR) condition is nearly identical to DE. The only difference is that near the top of the screen beneath the earnings summary, the subject is reminded that she will have the opportunity to donate her earnings to the charity she selected at the beginning of the experiment. An example reminder can be found in Figure 2.3b. We see this reminder as a minimally intrusive form of non-actionable solicitation, similar to a billboard. That is, subjects are reminded of the potential to donate, but cannot do so immediately. Any differences between DE

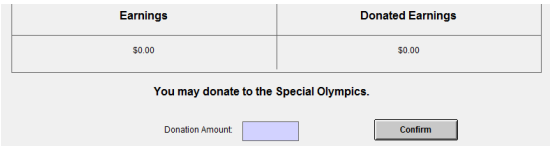
[16]This is essentially a dictator game where the recipient is a charity [Eckel and Grossman, 1996] in which the subject earns their endowment before determining the allocation between herself and another party [Oxoby and Spraggon, 2008].

Figure 2.3: Display of Earnings and Donation Opportunities During Effort Task

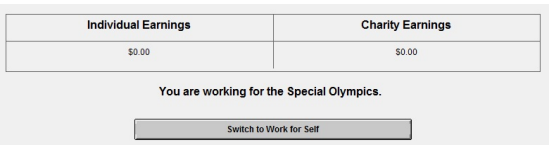
(a) Donate at the End



(b) Continual Reminder



(c) Continual Donation



(d) Toggle

and CR should only arise from non-actionable solicitation on subject behavior.

2.3.3.3 Continual Donation (CD)

In the Continual Donation (CD) condition, subjects could donate any of their current earnings to charity at any point during the experiment. Like CR, a subject in the continual donation condition has a sentence at the top of her screen, directly under her earnings summary, which informs her of the charity she selected at the beginning of the experiment, though with the addition of a box in which to enter a donation.

Subjects may have wanted to wait until the end to submit donations, so as to have more complete information on earnings. We see some evidence of this behavior; many subjects in this condition waited until the final 5 minutes to contribute. Because subjects were reminded at both two minutes and thirty seconds remaining that time was nearly expired, we feel that the likelihood of a subject wishing to donate but not submitting her donation in time is unlikely.[17]

[17]See Section 4.4 for further discussion.

2.3.3.4 Toggle (T)

The Toggle (T) condition simulates an agent's choice between working for oneself and volunteering for charity. Subjects had the option to have their effort accrue to themselves or to the charity. Each subject in the condition had a button (see Figure 2.3d) under their earnings display which allowed them to change how their earnings accrue; either the earnings went to the individual or the charity she selected at the beginning of the experiment. To avoid framing effects, subjects were allowed to choose if they would like to start working for charity or themselves and these buttons were randomized on the screen before the effort task began.

2.3.3.5 Toggle + Continual Reminder (T + CR)

The Toggle + Continual Reminder condition (T + CR) captures situations in which an individual may chose to give either time, money, or both. In this condition, the wages for effort for each account are randomly determined for the subject within a session. This within session randomization disambiguates the treatment and session effects. Subjects can work for either the charity or for themselves and known and fixed wages rates. Additionally, they can donate any of the money they earned for themselves to the charity at the end. The same steps are taken to avoid framing effects as were taken in Toggle. The subject would see the button in Figure 2.3d with the additional message reminder her that she may donate any personal earnings at the end of the effort task, as in Figure 2.3b.

2.3.4 Hypotheses and Predictions

Section 4.2 provides a theoretical model for charitable donation that may be applied to this experimental environment. Proposition 2.1 provides a prediction of subject behavior under the varying levels of solicitation in the three monetary

donation conditions. Corollary 2.1 gives a general prediction about the difference (or lack thereof) in subject behavior between the Toggle and monetary donation conditions due to warm glow. Applying Proposition 2.2 to these procedures leads to a specific predictions the relative use of donative types across different wage rates in the combined Toggle and Continual Reminder condition. Proposition 2.3 suggests a relation in the total amount given between the Toggle and the Toggle and Continual Reminder condition.

2.3.4.1 Solicitation

We begin by examining the potential effects of solicitation on donor behavior. Based on earlier research [Andreoni et al., 2011, DellaVigna et al., 2012, Meer and Rosen, 2011] and our theory (Proposition 2.1) linking solicitation to donative behavior, subjects who are reminded that they are able to donate to charity throughout the seventy-five minutes of the experiment may be more likely to give and give more than they otherwise would. Though unobtrusive, our reminder of a donation in the Continual Reminder condition could potentially induce a subject to donate somewhat more relative to what she would have given in DE.

Continual Donation and Continual Reminder vary only in that that CD uses actionable solicitation and CR uses non-actionable solicitation. One possible reason for greater donations under actionable rather than non-actionable solicitation is greater social pressure. The presence of the donation box itself may produce greater disutility from ignoring it; if this pressure increases with exposure to the actionable solicitation, then under Proposition 2.1 one would expect higher donations to charity when the opportunity to donate is constant for seventy-five minutes as opposed to only at the end of the effort task. Thus, we expect a greater amount of donations in the Continual Donation condition relative to the Continual Reminder.

Another possibility is that subjects derive more utility from giving several times than just once at the end of the experiment, or that habit formation drives multiple donations. In both T and CD, it is possible for a subject to give a little due to social pressure and then develop a giving pattern based on her prior gift(s) [Meer, 2013, Xiao and Houser, 2014].

Hypothesis 1 *Both actionable and non-actionable solicitation increase giving behavior, but actionable solicitation has a stronger effect. Therefore, consistent with Proposition 2.1, giving is greater in the Continual Donation condition than in Continual Reminder, which is in turn greater than in Donate at End.*

$$g_{DE} < g_{CR} < g_{CD}.$$

2.3.4.2 Warm Glow

The Toggle condition captures behavior when a subject can donate their effort rather than money; the other conditions involve donating already-accrued earnings to charity. This difference across conditions allows for us to rule out switching between charity and self due to convex preferences over effort tasks, unobservable heterogeneous abilities, or tastes over tasks which would be impossible to identify in a field experiment, along with other motivations for volunteering (networking, social status, and so on).[18] We feel this normalization gives us a clean approach to how people view potential donations of time and effort in a warm-glow context.

We assume that Toggle and Continual Donation feature the same level of actionable solicitation. In both CD and T, subjects have the same non-actionable solicita-

[18]Linardi and McConnell [2011] shows the importance of social pressure in continuing to volunteer if one's departure is observable; Carpenter and Myers [2010] examine volunteer firefighters and find that social reputation is an important factor in beginning to volunteer. These findings are related to the theoretical work of Ellingsen and Johannesson [2008] which looks at a model in which esteem from actions are based, in part, on the audience.

tion (reminder of the charity selected) and very similar actionable solicitation in the form of opportunities to contribute their resources to charity. Essentially, subjects can recreate the exact same giving patterns in T and CD if they desire. Therefore, differences in donation levels between the conditions are the result of differences between the warm glow associated with volunteering and monetary donations.

In our theoretical environment, Assumption 1 requires volunteering and donating earnings produce equivalent warm glow. This standard assumption found in previous models of warm glow [Duncan, 1999]. Under such conditions, Corollary 2.1 shows that donative activity should be equal in either method, leading to the following prediction.

Hypothesis 2 *Giving should be equal in the Toggle and Continual Donation conditions. Formally,*

$$g_{CD} = g_T.$$

An alternative to Hypothesis 2 consistent with the conventional wisdom is that individuals gain greater warm glow from volunteering time than giving money to charity and will contribute more in Toggle than Continual Donation. The thrust of this prediction comes from the observations on volunteering patterns discussed in our introduction. Thus, in our theoretical environment, we consider a rejection of Hypothesis 2 to be strong evidence against Assumption 1, and we would expect to see an alternative relation of $g_{CD} \leq g_T$ if that is the case.

Note that our hypotheses and alternative hypothesis form the ordered relation $g_{DE} \leq g_{CR} \leq g_{CD} \leq g_T$. The first relationship ($g_{DE} \leq g_{CR}$) indicates the possible difference between the no solicitation and non-actionable solicitation; both our model and our intuition predict the latter produces more giving. The second relationship ($g_{CR} \leq g_{CD}$) indicates the possible difference between actionable solicitation and non-

actionable solicitation; both our model and our intuition predict the latter produces more giving. Finally, ($g_{CD} \leq g_T$) indicates the possible difference between donating money versus volunteering labor for charity; our model predict no difference, but we suspect the latter produces more giving.

2.3.4.3 Substitution

To test the substitutability of donations of time and money, subjects can give both time and money in the Toggle + Continual Reminder condition. Hypothesis 3 applies Proposition 2.3 to a cross-condition comparison of Toggle and Toggle + Continual Reminder.

Hypothesis 3 *Giving in Toggle + Continual Reminder is at least as large as in Toggle. Further, the two are equal only when giving time and money are perfect substitutes.*

$$g_{T+CR} \geq g_T$$

If giving in $T + CR_{3/3}$ (where the subscript refers to the wage ratio, with the wage rate for oneself first and that for charity second, in cents) is equal to that in Toggle, it suggests that time and money are perfect substitutes in their warm-glow returns, provided the other assumptions of our model hold. That last caveat will be important for our results, because if the warm glow functions for donations of time and money are different, we cannot interpret results consonant with Hypothesis 3 to mean that gifts of time and money are perfect substitutes. We will discuss this point in more detail in Section 4.4.

The Toggle + Continual Reminder condition features a different wage ratios for individual work and work for charity. Our theoretical model provides predictions as the relation between these wages varies. Applying Proposition 2.2 to our experimental environment yields Hypothesis 4 and 5.

Hypothesis 4 *From Proposition 2.2, when $w > w'$ a greater proportion of donations will be money donations than time donations. If time and money donations are perfect substitutes, all donations will be of one form. Mathematically,*

$$1 \geq \left(\frac{d}{d+vw'}\right)_{\frac{4}{3}} > \left(\frac{d}{d+vw'}\right)_{\frac{3}{4}} \geq 0$$

with strict equality if donations of time and money are perfect substitutes.[19]

Hypothesis 4 provides a valuable test for perfect substitutability between donations of time and money. Donations must be of only one form—the one with the higher wage rate—under non-equal wages. Provided donations of time and money are not perfect substitutes we can make predictions about our Toggle + Continual Reminder condition under equal wages.

Hypothesis 5 *From Proposition 2.2, provided donations of time and money are not perfect substitutes, equal amounts should be given through time and money donations if the wages rates for personal and charitable work are equal.*

$$d_{\frac{3}{3}} = (vw')_{\frac{3}{3}}$$

Note that if time and money are perfect substitutes we cannot make any predictions about subject behavior with equal wages, because any allocations of giving time and money would be optimal. The allocation would produce the same utility at the same cost.

Combining hypotheses 4 and 5, we can predict that if time and money donations are not perfect substitutes, then a majority, but not all donations will be from

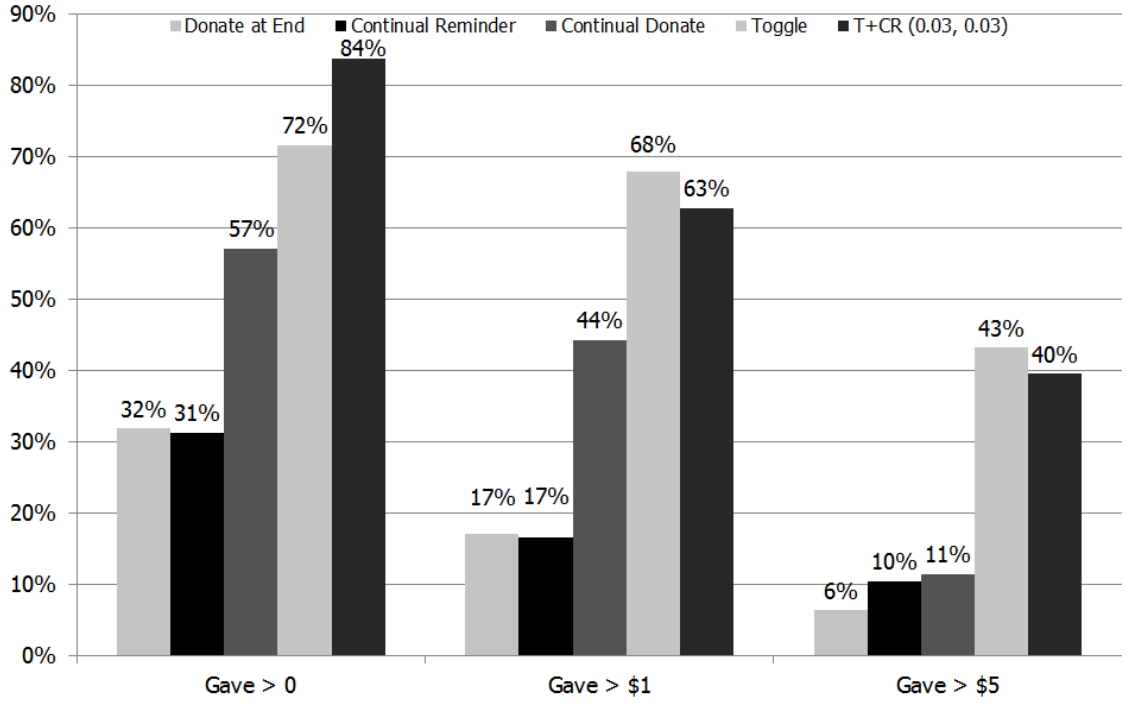
[19]For notational simplicity we use parentheses and one subscript to denote wage conditions rather than multiple subscripts. That is, the proportion of donations of that occur through money in $T + CR_{4/3}$ is written $\left(\frac{d}{d+vw'}\right)_{\frac{4}{3}}$ rather than $\frac{d_{\frac{4}{3}}}{d_{\frac{4}{3}}+v_{\frac{4}{3}}w'_{\frac{4}{3}}}$.

money in the $T + CR_{3/4}$ condition; a majority, but not all donations will be from time donations in the $T + CR_{3/4}$ condition, and the donations will be equal across methods in the $T + CR_{3/3}$ condition.

2.4 Results

Table 2.1 provides summary statistics across conditions. There are no significant differences in effort, as measured by sliders completed, across treatments. Figure 2.4 shows donations across conditions by giving thresholds. It is clear that subject donations vary greatly across conditions; a Kruskal-Wallis test rejects the hypothesis that the distribution of donations is the same across conditions ($p = 0.000$).

Figure 2.4: Dollars Donated above Various Thresholds by Treatment



We also present the percent of earnings donated in Table 2.1, row 8; this eliminates

the possibility that individuals in one condition are earning less but behaving more generously (for instance, an individual earning $20 and giving all of it to charity would appear to be the same as one earning $30 and donating $20 to charity). Table 2.1 demonstrates that this is not a concern. The patterns of giving behavior as measured by percent of earnings are qualitatively and quantitatively similar to those measured in dollars; the exceptions in which the results do differ are discussed below. This is not surprising, given the similarity in effort across conditions.

Our first result examines the effectiveness of non-actionable solicitation by comparing Donate at End and Continual Reminder.

Result 1 *Donative behavior in the Continual Reminder condition is not different than the Donate at End condition.*

A Kolmogorov-Smirnov test shows no difference between the CR and DE distributions ($p = 0.831$). In addition to nonparametric tests of equality of distributions, we examine several outcomes directly.[20] We focus on the giving rate across conditions, the total amount donated, the amount donated conditional on making a donation, and quantile regressions at the 25th, 50th, and 75th percentiles. We also examine the probability of giving one dollar or more; there is some evidence to suggest that subjects were donating their change in an effort to receive a whole dollar amount as payment. In an effort to focus on those who gave more than a token amount, we also examine the probability of giving five dollars or more. Comparisons of these amounts across conditions can be found in Table 2.1. The two conditions also do not differ either in giving rate ($p = 0.945$), amount given ($p = 0.449$), amount given conditional on giving ($p = 0.367$), or at the 25th, 50th, or 75th percentiles of giving

[20]To test whether subjects' characteristics affect our results, we also performed the estimations in this section with a number of controls, such as gender, geographic origin (Texas or elsewhere), and so on. As one would expect from random assignment, our results are qualitatively unaffected. Full results are available on request.

conditional on making a gift (p = 0.991, p = 0.503, and p = 0.890, respectively). There is no difference between conditions in the probability of giving more than one (p = 0.945) or five (p = 0.704) dollars. We therefore find no evidence to suggest that non-actionable solicitation in the form of a simple reminder has an effect on giving. Perhaps the reminder text can be ignored easily (similar to billboard solicitations) or there is sufficient distance between the reminder and the opportunity to donate, and this type of solicitation does not induce giving from those who would not otherwise have done so.

We next turn to the differences between actionable and non-actionable solicitation. Result 2 confirms that actionable solicitation has a positive effect on subject donation in our environment, though non-actionable solicitation does not have an effect. This is partly consistent with Hypothesis 1.

Result 2 *The probability of making any gift is greater in the Continual Donation condition than in Continual Reminder, but differences in gift size are less pronounced.*

The giving rate in CD is higher than that in CR (p = 0.004) and a Kolmogorov-Smirnov test shows differences between the CD and CR distributions (p = 0.008). The percent given (p = 0.071) to charity is higher, and subjects are more likely to give a dollar or more (p = 0.000) and five dollars or more (p = 0.026). However, the mean amount given in CD is not significantly higher than in CR, even though, as discussed above, the overall distributions are different. The total amount donated (p = 0.232), amount given conditional on donating (p = 0.903), and the 25th, 50th, and 75th percentiles conditional on giving (p = 0.675, p = 0.567, p = 0.867) are not significantly different.

Table 2.1: Effort and Donative Activity Summary Statistics

	Donate at End	**Continual Reminder**	**Continual Donation**	**Toggle**	**T+CR (0.03, 0.03)**	**T+CR (0.04, 0.03)**	**T+CR (0.03, 0.04)**
N	47	48	70	81	43	45	41
Sliders Completed	886.28	962.5	911.99	905.11	822.53	852.29	900.49
	(224.64)	(238.51)	(250.33)	(263.78)	(203.90)	(244.53)	(279.61)
Earnings from Effort	26.59	28.88	27.36	27.15	24.68	33.16	28.3
	(6.74)	(7.16)	(7.52)	(7.91)	(6.12)	(8.57)	(8.89)
Percent Giving Any Amount	31.90	31.30	57.10	71.60	83.72	75.56	80.49
Percent Giving $1 or More	17.02	16.67	42.86	67.90	60.47	63.41	62.22
Percent Giving $5 or More	10.64	8.33	22.43	43.21	39.53	41.46	40.00
Amount Donated	1.02	1.64	2.85	5.55	4.52	5.64	5.78
	(2.26)	(5.23)	(5.49)	(6.00)	(5.59)	(7.94)	(6.77)
Percent Donated	3.89	5.48	11.79	20.17	20.60	17.18	19.21
	(9.08)	(16.81)	(22.85)	(20.64)	(25.95)	(23.19)	(20.05)
Conditional on Giving							
N	15	15	40	58	36	34	33
Earnings from Effort	27.11	27.47	24.81	27.3	23.72	33.75	28.43
	(6.74)	(6.69)	(6.54)	(8.04)	(6.04)	(9.24)	(9.34)
Percent Giving $1 or More	53.3	53.3	77.5	94.8	72.22	82.35	78.79
Percent Giving $5 or More	33.30	26.7	40	60.3	47.22	52.94	51.52
Amount Donated	3.2	5.26	4.97	7.76	5.4	7.47	7.18
	(3.06)	(8.44)	(6.52)	(5.75)	(5.83)	(8.37)	(6.85)
Percent Donated	12.2	17.5	21.2	28.2	24.6	22.74	23.87
	(12.8)	(26.9)	(26.9)	(19.2)	(26.59)	(24.23)	(19.7)
25th Percentile of Giving	0.70	0.69	1.00	2.70	0.98	1.68	2.44
50th Percentile of Giving	3.00	1.02	2.30	6.65	4.81	5.61	5.25
75th Percentile of Giving	5.00	5.38	5.00	10.95	7.57	10.12	11.84

A far greater proportion of subjects (31.2 percent vs. 57.1 percent) gave when they were offered the opportunity to do so through the experiment, and there appears to have been some shifts above relatively small amounts such as one or five dollars, but these individuals did not give much more. Thus, it seems that allowing for giving during the task tends to elicit a higher likelihood of giving, but conditional on giving, the differences in donations are not large. This is consistent with the findings in Meer [2011b], in which "the mere act of making a gift alleviates the social pressure [from solicitation], but making a larger gift has no effect." We therefore view actionable solicitation as having some effect on behavior.

Finally, we compare our volunteer condition (Toggle) to Continual Donation, the condition that most closely matches Toggle in actionable solicitation. Indeed, subjects can recreate the same pattern of donative behavior in CD as in T. However, subjects in CD do nearly all of their giving at the very end of the experiment, with nearly 80% of the amount donated coming in the last ten minutes, while subjects in T give at a consistent rate throughout the experiment.[21]

Result 3 *Donative behavior in the Toggle condition is stronger than in Continual Donation.*

We see substantial differences in the amount donated in these two conditions, not just their timing. We can easily reject the hypothesis that these two distributions are the same with a Kolmogorov-Smirnov test ($p = 0.001$); indeed, on every metric, T dominates CD. The giving rate ($p = 0.066$); giving one or more dollars ($p = 0.006$); giving five or more dollars ($p = 0.007$); amount given ($p = 0.004$); amount given conditional on giving ($p = 0.032$); 25th percentile ($p = 0.001$); 50th percentile (p

[21]The precise timestamps for one session of the Toggle condition were corrupted; these data are excluded from our analysis; there is no reason to believe that the inclusion of this particular session would affect the overall time pattern.

= 0.008); and 75th percentile (p = 0.000) are all higher under T than CD. These results also hold with comparison between both T and CR and T and CD; indeed, with the exception of a small number of very generous individuals who gave all or nearly all of their earnings, the distribution of giving for T is always higher than the other conditions.

The differences are economically substantial as well. Subjects in T are nearly 15 percentage points more likely to make a gift than in CD and about 40 percentage points more likely to give than in CR or DE. The unconditional mean gift ($5.55) is nearly twice the size of that in CD ($2.85) and five times the size of that in DE ($1.02). Conditional on making a gift, those in the Toggle condition give more: 50% more than in Continual Donation and twice as much as in Donate at End. Nearly every subject who donated in T gave more than a dollar, as compared to about half in DE and CR and three-quarters in CD.

As discussed in Section 4.3, our stylized experiment eliminates many of the other rewards to volunteering. The magnitudes of these results are powerful evidence against Hypothesis 2, that giving effort directly, akin to volunteering, provides the same warm glow as donating money. Taken together, these results suggest that both the act of working directly for charity and being solicited with the immediate ability to donate (actionable solicitation) increase the level of charitable donations in our environment. The act of being reminded about donating to charity (non-actionable solicitation) has little effect on donative behavior.

Result 4 *There is no difference in giving between the Toggle condition and Toggle + Continual Reminder (with equal wage ratio).*

As seen in Figure 2.4, the probability of giving at all is slightly higher in Toggle than in $T + CR_{3/3}$ (p = 0.14), though there are no significant differences in giving

over one dollar (p = 0.57) or over five dollars (p = 0.70). A Kolmogorov-Smirnov test finds no difference in the two distributions (p = 0.39); Figure A-1 and Table 2.1 show no significant differences in any giving measure.

Our hypothesis is that the slightly higher rate of small gifts in $T + CR_{3/3}$ is due to an aversion to receiving coins in payment (see Fielding and Knowles [2013] for a recent experiment showing that subjects donate more to charity when their payment is in the form of loose change). This is confirmed in the data: a number of donors in $T + CR_{3/3}$ gave only enough to leave themselves with an even amount. The distributions of giving behavior are quite similar otherwise; more to the point, this increase in small gifts is likely driven by "change aversion" rather than altruism. Our results are consistent with Hypothesis 3 and provide support for the idea that gifts of time and money are substitutes. In fact, this result is consistent with the idea that gifts of time and money are *perfect* substitutes. However, our next result presents evidence against this claim.

Result 5 *The proportion of donations from time is highest when the wage ratio is skewed towards earning directly for charity. When the wage ratio is equal, donations from time are still strongly preferred; when the wage ratio is skewed towards earning for oneself, the proportion of donations from time is still greater than the proportion of donations of money.*

We next compare $T + CR_{3/3}$, $T + CR_{4/3}$, and $T + CR_{3/4}$.[22] We see no meaningful differences in total donative behavior across these conditions in Table 2.1, Figures A-2 and A-3. However, Figure A-4 shows substitution towards giving money as the relative wage rate for money increases. Roughly three-fourths of donations are made

[22]We test for the possibility of income effects with a $T + CR_{3.5/3.5}$ treatment, but find no meaningful differences in the percent donated or the allocation of monetary and time donations. We therefore conclude that differences in giving patterns are driven by the wage ratio rather than increased income.

through volunteering in $T + CR_{3/3}$. When donations of time have greater value, in $T + CR_{3/4}$, 89.5% of donations are made through volunteering. Yet that amount drops only to 52.5% when earning for oneself and then donating the proceeds is significantly favored. We note this general relation is consistent with the general direction found in Hypotheses 4 and 5 where donations of time and money are not perfect substitutes. However, those hypotheses suggest donations of time and money should be equal in $T + CR_{3/3}$, and money donations should substantially be greater than time donations in $T + CR_{3/4}$; neither of these assertions are supported by our data.

Further, the results reject the idea of donations of time and money being perfect substitutes in this environment. Hypothesis 4 suggests that all donations should have been made monetarily in $T+CR_{4/3}$, yet a (slight) majority of donations are still made through volunteering. While 89.5% of donations are made through volunteering in $T + CR_{3/4}$ (with much of the monetary donations representing rounding), it is much more likely given the other experimental results that this is due to the notion that subjects receive greater warm glow from gifts of time than from those of money. In sum, the results suggest that these donations are imperfect substitutes.

2.5 Alternative Explanations

There are several seemingly promising alternative explanations for our results that subvert our hypothesis of differential warm glow. These explanations arise specifically from our experimental environment, rather than generally applying to situations involving charitable giving; that is, they suggest the subjects' preferences for donating time may be a confound of our design. We address each hypothesis in turn.

2.5.1 Differential Cost of Donation

One possibility is that the cost to give in Continual Donation is greater than that in Toggle. In the latter condition, subjects only push a button to donate, while in CD subjects must choose an amount to donate, enter the amount, and push a button. As field literature has shown [Meer and Rigbi, 2013, Rasul and Huck, 2010, Knowles and Servatka, 2014], even a minor cost may greatly reduce charitable donations. If our experiment is a similar environment to the field, these minor costs might explain the difference between the two conditions.

The data do provide evidence that subjects do not endure a greater cost per donative action in CD than in T. The average productivity of subjects in CD declines by about 23% in minutes in which they make a donation, while subjects in T see a productivity decline of 16% in minutes in which they switch the target of their earnings. Moreover, conditional on switching at all, the median subject in T switches three times, while the median subject in CD only donates once, usually in the last few minutes of the experiment. The total expected loss from switching among those in T is 8.1 sliders, while the expected loss from giving is 7.4 sliders for givers in CD; this difference is approximately two cents. We therefore believe that the difference in behavior between CD and T does not arise from differences in the cost of making a donation.

2.5.2 Momentum

Another explanation for the increased donations in T is that the condition takes advantage of momentum. With a touch of a button, donations become the status quo and subjects must exert effort to stop donating. Status quo bias is widely regarded as an important driver of behavior [Samuelson and Zeckhauser, 1988]. The other conditions do not have an equivalent momentum component, so this difference may

explain the greater amount in contributions among donating subjects in toggle.

In order to avoid a default setting, subjects in T had to choose whether they would begin donating to themselves or charity before the experiment began; 36% of subjects started the experiment donating to charity. With well over half of subjects beginning by working for themselves, this mechanism could also explain *lower* donation levels in Toggle. A subject could get caught up in working for herself and not donate anything to charity. That is, momentum does not favor working for charity over oneself or vice versa. Further, the data do not appear to support the momentum explanation; as mentioned above, among those who work for charity at all, the median subject switched three times.

2.5.3 Miscalculation

Another possible explanation is that subjects somehow miscalculate and overshoot their desired gift to charity in the Toggle condition, but do not make a similar mistake in any of the other conditions. If this explanation is true, we would expect to see subjects accumulating the bulk of their donations to charity in the early part of the experiment. That is, over the course of the 75 minute experiment, they would regret this initial donation and compensate by switching to earning for themselves towards the end. The data do not support this contention at all, as seen in Figure A-5; donations in the Toggle conditions are distributed almost uniformly over time. We therefore do not find this explanation credible.

Further, the Toggle + Continual Reminder condition provides an even better test of this miscalculation idea. With equal wage rates, subjects worried about miscalculation could work entirely for themselves through the 75 minute slider task and then donate an exact amount of their earnings to charity. This is not the case; Figure A-4 shows that roughly three-fourths of all donations occur through Toggle

in these conditions.

2.5.4 Loss Aversion

Loss aversion—in which the utility change from a loss is greater in magnitude than that from an equivalent-sized gain—is a fundamental part of behavioral economics literature (Kahneman and Tversky [1979]; see Camerer [2005] for a survey). In this context, time donations could be seen foregone gains, while the earnings accrued for oneself and then given to charity represent losses. Since individuals are loss averse, the utility loss would be greater for a subject giving their earnings to charity than from forgoing an identical amount in potential earnings. Then individuals would be more likely give donations in time rather than money; this is true both in our experimental setting and in actual decisions regarding volunteering and monetary contributions.

In general, it is very difficult to differentiate an explanation of loss aversion from differential warm glow. Under the warm glow mechanism, working for charity produces a greater benefit; with loss aversion, donating money incurs a greater cost. For several applications of a basic model, these two features are mathematically equivalent.

An simple way to test these competing explanations in an experiment would be to have pre-committment where subjects decided whether to donate time or money to charity before they earned anything. In an experiment similar to ours, Lilley and Slonim [2013] use pre-committment, but still find a significant preference for donations of time. Further, the extent of loss aversion and how it is framed in the laboratory experiments is a topic of some controversy [see Plott and Zeiler, 2005]. For these reasons, we do not believe that loss aversion is solely responsible for our results.

That being said, loss aversion can have profound affects on donative behavior in the field. Breman [2011] conducts a field experiment designed to reduce loss aversion and induce donors to increase their charitable contributions of money. Donors who are asked to increase their monthly contributions in the future are more likely to do so than donors asked to give immediately. Given this result, it plausible that a gift of a time rather than money might inhibit loss aversion in general and make decision to give time more attractive.

2.6 Conclusions

This paper presents a series of laboratory experiments investigating whether individuals behave more generously when working for directly for charity (volunteering) rather than working for themselves and donating part of their earnings, as well as the effect of solicitation on giving. The comparison of results between Donate at End and Continual Reminder conditions shows that non-actionable solicitation does not seem to have a substantial effect on giving, at least in our laboratory environment. There is some evidence that actionable solicitation (added in the Continual Donation condition) has some effect, mostly on the extensive margin—consistent with previous research. Comparing Continual Donation to Toggle, we find results consistent with a strong difference in warm glow from volunteering and standard monetary gifts; subjects in our experiment donate more often and at greater levels when working for charity than when donating earnings they have already accrued. The results of the Toggle + Continual Reminder condition further demonstrate subjects' preference to make donations of time over money. Across all wage rates—even when equivalent donations of money can produce 33% more benefit—a majority of donations come in the form of time. Looking across our conditions, it seems evident, moreover, that gifts of time and money are substitutes.

We argue the explanation of differential warm glow for donations of time and money is the best explanation for our main result. All of our experimental results are consistent with a standard model of charitable giving that relaxes this one assumption. They are not consistent with such model if the assumption for equal warm glow between activities is maintained. Ad-hoc explanations that attempt to explain away our main experimental as a confound of our design simply do not match the empirical regularities in our data.

Thinking more broadly, the explanation of differential warm glow may be thought of alternative viewpoint to the frequently discussed economic anomaly of gift-gifting [e.g. Camerer, 1988, Waldfogel, 1993, Prendergast and Stole, 2001, Ellingsen and Johannesson, 2011]. In almost all cases, non-monetary gifts are a less efficient use of resources than a direct monetary gift (much like our volunteering example), but they are given far more frequently than monetary gifts. The prevailing explanation is that non-monetary gifts, while inefficient, are more conspicuous and thus have superior signaling properties (Ellingsen and Johannesson [2011]). As our donations to charity are anonymous, and donations of time and money are treated identically by experimenters (i.e., they end up being money in the same envelope), our experiments eliminate these signaling motivations, yet the preference for a non-monetary gift to charity is still preferred. This may indicate individuals use non-monetary gifts rather than monetary gifts in social situations simply because they derive greater pleasure from giving non-monetary gifts, regardless of signaling motivations. Previous experiments were unable to isolate and test these explanations separately. Ellingsen and Johannesson [2009] note that subjects are more willing to sacrifice time rather than money in an ultimatum game, but the structure of that game makes it impossible to disentangle whether social factors or preferences over giving are responsible for that result.

Given these experimental results, a natural question to ask would be how they might translate to other settings. We suspect that factors like social recognition, enjoyment of the volunteer activity itself, and the salience of one's "donation" all may increase the utility from donating time to charity rather than money.

Nonetheless, charities must balance the higher willingness of their donors to volunteer with the greater impact of their monetary donations. Unlike in our experiment, where wages for volunteering never fell below 75% of one's personal wage, it is realistic to think one's actual opportunity cost of time may be substantially greater than the value to the charity of the volunteering activity (as it was in our motivating example of the consultant in the soup kitchen). In such cases, charities still may prefer to solicit monetary donations even if individuals are willing to give (based on their personal costs) considerably less. Another implication of differential warm glow is that individuals will accept a lower wage working in the non-profit sector than a higher wage in the for-profit sector, even though they could donate the difference in income to the charity.[23] Regardless of its relative impact in these settings, our results strongly suggest economic models must consider the warm glow associated with gifts of time and money as different entities.

[23]There is disagreement as to whether those working for non-profits are paid less, all else equal. For example, Ruhm and Borkoski [2003] find no evidence of wage differentials. On the other hand, Preston [1989] finds that those in the non-profit sector earn less, and a recent field experiment by Frank [2012] found that half of workers in an online labor market were willing to accept a lower wage rate to work for an organization with greater "social value."

3. SOCIAL DISTANCE AND QUALITY RATINGS IN CHARITY CHOICE

Third-party charity ratings are an increasingly popular approach for potential donors to select charities. A recent New York Times article argued selecting a worthwhile charity has never been more challenging [Wasik, 2013]. This difficulty is due, in part, to the presence of numerous charities, many with closely-related missions; indeed, a recent survey found that only 35 percent of donors do any research before giving [Hope Consulting, 2010]. It is not surprising that donors often use a charity's prominence as a heuristic for its quality, but this approach may be in conflict with preferences for more local charities [DellaVigna et al., 2012, Meer, Forthcoming], which are likely to be less well-known.

We conduct an experiment in which we vary the information about charities and ask subjects to choose a charity to which they may donate. Subjects are presented with a menu of charities with both local and non-local charities serving the same causes; in some treatments, third-party ratings are presented.[1] To our surprise, we find that subjects do not exhibit strong preferences for local charities. Third-party evaluations of the charities tend to have an impact on the selection of a charity; there is some impact on donative behavior, but it is difficult to ascribe a causal interpretation to these results.

3.1 Literature Review

It is a commonly-held belief that individuals prefer to give to local charities, much as "buy local" movements have become increasingly common. For example, Kentucky, among other states, has a day dedicated fundraising for local charities. Kentucky Gives Day raised over $440,000 in one day for local charities in 2014 [Stacy,

[1] Throughout the paper, we use "non-local" and "national" interchangeably.

2014]. Social identity theory, which is formalized in economics by Akerlof [1997] and Akerlof and Kranton [2000], suggests that individuals will treat in-group members more generously than others. Chen and Li [2009] provide an extensive review of the early literature. In recent work, Agrawal et al. [2013] show that social distance may not be as large of a concern in internet crowdfunding, finding that the average donor is roughly 3,000 miles from the artist to which she donates. Similarly, Meer and Rigbi [2013] find that lenders of micro-loans are impacted on the margin by the transaction costs of language translation, but not location of the borrower; though Meer [Forthcoming] shows that donors who live in the same area as a teacher requesting funds at DonorsChoose.org are less sensitive to the price of giving, suggesting a preference for local projects. Similarly, in an experiment with door-to-door solicitation of charitable gifts, DellaVigna et al. [2012] find that there are preferences for less-distant recipients of philanthropy.

Quality metrics may also influence the behavior of potential donors. There are many papers which highlight that consumers respond to ratings and reputation (or lack thereof) of sellers (e.g., Reinstein and Snyder [2005], Jin and Sorensen [2006], Luca [2011], Varkevisser et al. [2012], Brown et al. [2012, 2013a]). For charities in particular, Chhaochhari and Ghosh [2008] find that charities with the highest ratings received sixteen percent more charitable donations than those with the lowest ratings. Similarly, Gordon et al. [2009] find that increases in the number of stars awarded by Charity Navigator leads to an increase contributions to the charity. Yoruk [2013] illustrates that the impact on donor contributions of an additional star in Charity Navigator's rating system is a function of charity size and current rating; for small charities, a one star increase from two to three or three to four stars leads to a roughly twenty-eight percent increase in the amount of donations received by the charity. Conversely, Grant [2010] finds that donors over-rate charities and that, once

rated, donors decrease their giving — especially for lower rated charities. Szper and Prakash [2011] use charities within Washington state and find no relationship between charity ratings and contributions from donors. Related work by Butera and Horn [2014] illustrates that image conscience donors may treat quality information and the size of their gift as substitutes and that when giving is private, individual donors largely ignore bad news about the charity.

3.2 Experimental Procedures

All experiments took place at the Economic Science Laboratory in the Department of Economics at Texas A&M University. 414 undergraduates were recruited from econdollars.tamu.edu, an ORSEE [Greiner, 2004] website database.

Subjects performed the same effort task over identical lengths of time and faced the same list of charities with the order randomized for each subject. Subjects earned all money they donated to charity rather than receiving it as an endowment; this design choice is closer to conditions outside the laboratory where individuals are likely donating from their earned income.[2]

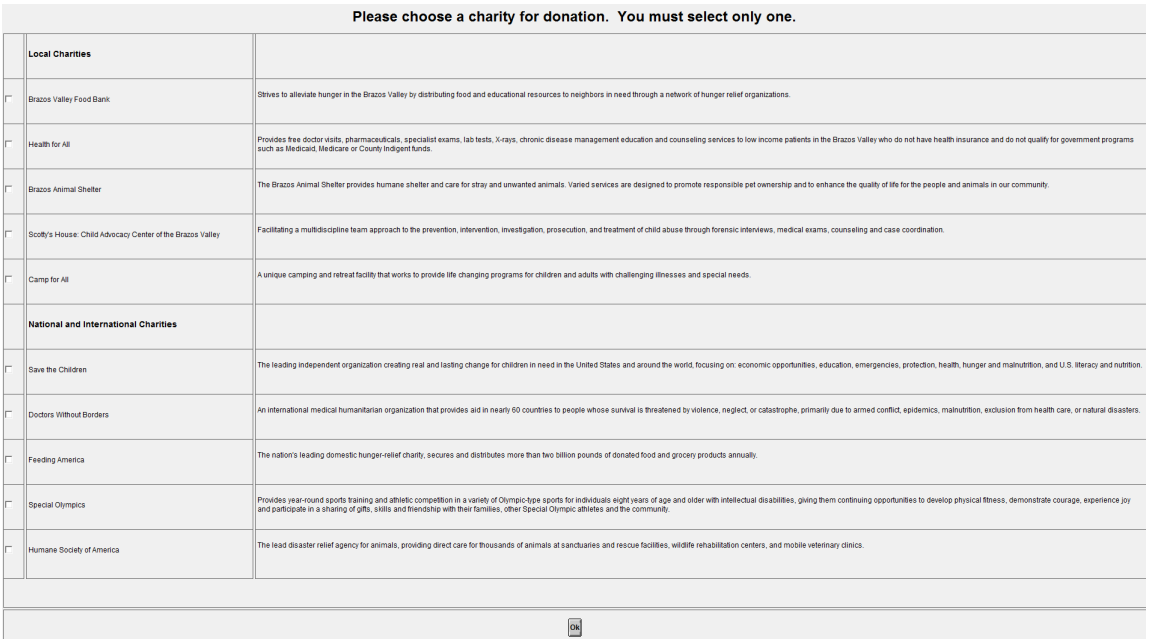
3.2.1 Charity Selection

Subjects were informed they would have to select one charity from a menu of ten charities and corresponding descriptions. The ten charities are listed in Table 3.1. Charities were randomly sorted on the screen into one of two different menu styles, organized either by location (local vs. national) or by type of charity (e.g. food security, special needs, etc.). The order of the relevant categories was randomized, as was the order of charities within each category. This random sorting was done to help assuage any concerns of anchoring effects from specific menus. An example

[2]Reinstein and Riener [2012] show there are large differences in donation behavior when subjects are endowed with money rather than earning their endowment in the laboratory; they find that those subjects who earned their compensation choose to donate less to charity.

menu can be seen in Figure 3.1. The description of the charities activities is taken directly from the charities' homepages with minor changes.[3] Subjects were given up to four minutes to review the options available to them and select their charity.[4] Each subject knew that her choice was finalized once selected and understood that selection of a charity did not require compulsory contribution to it. After all subjects selected a charity, the experiment would proceed.

Figure 3.1: Sample Charity Selection Menu by Location, No Quality Information

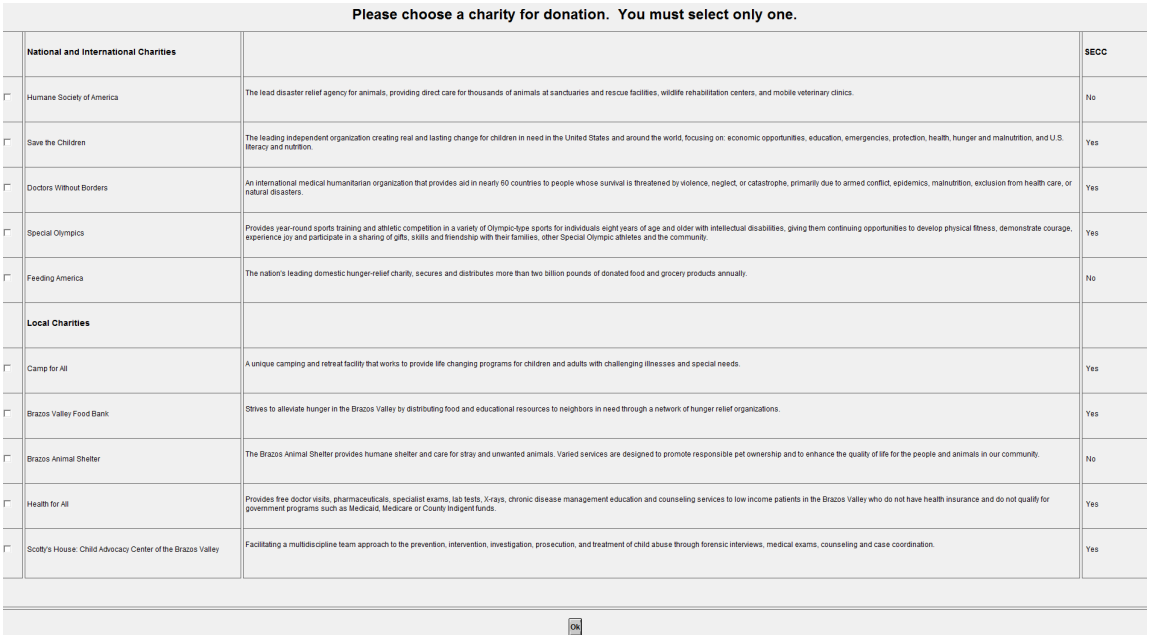


A central question in this paper concerns how individuals may react to third-party assessments of the charities. Therefore, during the charity selection process, some subjects were given information detailing which charities were approved to be a

[3]We removed pronouns which might be considered loaded language so that all descriptions were neutral.

[4]This process rarely took more than two minutes.

Figure 3.2: Sample Charity Selection Menu by Location, Quality Information



Please choose a charity for donation. You must select only one.

	National and International Charities		SECC
☐	Humane Society of America	The lead disaster relief agency for animals, providing direct care for thousands of animals at sanctuaries and rescue facilities, wildlife rehabilitation centers, and mobile veterinary clinics.	No
☐	Save the Children	The leading independent organization creating real and lasting change for children in need in the United States and around the world, focusing on: economic opportunities, education, emergencies, protection, health, hunger and malnutrition, and U.S. literacy and nutrition.	Yes
☐	Doctors Without Borders	An international medical humanitarian organization that provides aid in nearly 60 countries to people whose survival is threatened by violence, neglect, or catastrophe, primarily due to armed conflict, epidemics, malnutrition, exclusion from health care, or natural disasters.	Yes
☐	Special Olympics	Provides year-round sports training and athletic competition in a variety of Olympic-type sports for individuals eight years of age and older with intellectual disabilities, giving them continuing opportunities to develop physical fitness, demonstrate courage, experience joy and participate in a sharing of gifts, skills and friendship with their families, other Special Olympic athletes and the community.	Yes
☐	Feeding America	The nation's leading domestic hunger-relief charity, secures and distributes more than two billion pounds of donated food and grocery products annually.	No
	Local Charities		
☐	Camp for All	A unique camping and retreat facility that works to provide life changing programs for children and adults with challenging illnesses and special needs.	Yes
☐	Brazos Valley Food Bank	Strives to alleviate hunger in the Brazos Valley by distributing food and educational resources to neighbors in need through a network of hunger relief organizations.	Yes
☐	Brazos Animal Shelter	The Brazos Animal Shelter provides humane shelter and care for stray and unwanted animals. Varied services are designed to promote responsible pet ownership and to enhance the quality of life for the people and animals in our community.	No
☐	Health for All	Provides free doctor visits, pharmaceuticals, specialist exams, lab tests, X-rays, chronic disease management education and counseling services to low income patients in the Brazos Valley who do not have health insurance and do not qualify for government programs such as Medicaid, Medicare or County Indigent funds.	Yes
☐	Scotty's House: Child Advocacy Center of the Brazos Valley	Facilitating a multidiscipline team approach to the prevention, intervention, investigation, prosecution, and treatment of child abuse through forensic interviews, medical exams, counseling and case coordination.	Yes

Ok

member of the State Employee Charitable Campaign of Texas and, separately, which charities received a three or four star rating from CharityNavigator.[5]

3.2.1.1 Baseline – No 3rd Party Ratings

In this treatment, subjects viewed the standard charity menu depicted in Figure 3.1. The instructions and menu do not mention information about third party metrics or ratings. This information serves as a baseline for charity selection and donation behavior.

[5]An "ideal" experiment would randomly generate both positive and negative ratings for each subject and local and non-local categories for each charity, providing much more variation. However, this would constitute deception; we use information from multiple agencies to generate the differences that identify the effect of ratings, but it is not possible to identify both individual charity effects and location effects.

3.2.1.2 Charity Navigator Ratings

In this treatment, subjects see a menu like that in Figure 3.2. A column is added to indicate if the charity was given a three of four star rating from Charity Navigator; the statement describing the charities' objectives were unchanged. Subjects were informed that all charities rated by Charity Navigator were evaluated on Financial Health and Accountability and Transparency.

3.2.1.3 State Employee Charitable Campaign Membership

Similar to the Charity Navigator treatment, the State Employee Charitable Campaign (SECC) information treatment informed subjects which charities were approved members of this campaign. As with the Charity Navigator treatment, subjects were informed the criteria by which charities were approved by the SECC.[6]

3.2.2 Effort Task and Payment Schedule

The effort task began after all subjects had selected their charity. Subjects had 75 minutes to move as many "sliders" from one position on the screen to a specific randomized target (see Figure 3.3) as they could.[7] In all conditions they would be paid a fixed amount per slider completed in addition to a participation award of \$5.00.[8]

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[6]These requirements for approval are:

- They are recognized by the IRS as 501(c)(3) nonprofit organizations and registered with the Secretary of State.
- They are audited (or reviewed) annually by an accountant in accordance with generally-accepted auditing standards.
- They provide direct or indirect health and human services.
- They spend no more than 25 percent of funds raised on administration and fund raising unless they qualify for an exception due to special circumstances.
- They meet other requirements per the application.

[7]This task was developed by Gill and Prowse [2012].

[8]Subjects were not permitted to give their participation award to charity.

Table 3.1: Charities Used

Charity	Location	Type	SECC	Charity Navigator
Special Olympics	Non-Local	Special Needs	Yes	Yes
Camp for All	Local	Special Needs	Yes	Yes
Humane Society of America	Non-Local	Animal	No	Yes
Brazos Animal Shelter	Local	Animal	No	No
Save the Children	Non-Local	Children	Yes	Yes
Scotty's House	Local	Children	Yes	No
Doctors Without Borders	Non-Local	Health	Yes	Yes
Health for All	Local	Health	Yes	No
Feeding America	Non-Local	Food Security	No	Yes
Brazos Valley Food Bank	Local	Food Security	Yes	Yes

Subjects moved their slider markers along the line to a randomly generated target number (an integer in the set $[1, 99]$), with the slider beginning at the far left at the point corresponding to 0. In Figure 3.3, the target position is located at 73 and the subject's current position is at 63. Once the subjects aligned their markers, they were credited the appropriate wage and they were able to move to another slider.

Figure 3.3: An Example Slider

Subjects saw thirty sliders (ten rows of three) on the screen and could complete the sliders in any order; once all thirty sliders were finished, the page reset with thirty more sliders and newly randomized target numbers for each slider. This process repeated throughout the experiment until the time expired, providing no upper

bound on the amount of money subjects could earn. Subjects who did not wish to participate in this task for the full length of time were allowed to browse the internet. An earnings summary and the time remaining were displayed at the top of the screen, and subjects were given a verbal notification both when two minutes and thirty seconds remained.

Within this framework, we varied the methods of donation available to the subjects; in some treatments subjects were able to donate money they earned whereas in others subjects were able to complete slider bars which earned money directly for the charity (giving effort). We find a strong preference for gifts of time and effort over those of money [Brown et al., 2013b]. Importantly, the charity choice portion of the experiment was randomized separately from the method-of-donation portion; we control for the treatments discussed in [Brown et al., 2013b] in all our specifications.

Subjects were paid individually and discretely in cash at the conclusion of the experiment to avoid any social stigma from their earnings and donation selection. Subjects were presented two envelopes; one envelope was unlabeled and contained their personal earnings while the second was labeled with the charity's name. If a subject chose to donate money to charity, the second envelope would contain that amount of money. Each subject was asked to confirm that these amounts were correct and sign a form stating that they wished to contribute their charity total to the charity whose name was on the envelope. The experimenter then collected the charitable envelope from the subject, taped it shut, and placed the envelope in a box labeled donations. Subjects were informed that all donations would be made within 90 days and were given contact information for the experimenter making the donation. Donation totals for each charity were calculated, and a donation in that amount was given to each charity at the conclusion of the sessions.

3.3 Results

3.3.1 Charity Selection

Subjects were presented the list of charities in a menu. In Figure 3.4, we show the charities chosen by subjects; the second panel of Figure 3.4 shows the position on the menu of the chosen charity, which indicates that subjects appear to have gone through the entire list before selecting. Almost exactly half of charities selected across all information treatments were local (48.7%).

Table 3.2 displays the results of an OLS regression where the dependent variable is a binary variable equaling one if the chosen charity is a local one (results are similar when using a probit model); we pool the two information treatments (results are similar if they are entered separately). Only the type of charity had a statistically significant influence on subjects' choice of the local charity; none of the other categories have any individually or jointly significant variables. Surprisingly, a subject being from the state of Texas does not influence her to select a local charity, with a coefficient that is both small and statistically insignificant.[9]

To gauge the impact of quality information and, in particular, how it interacts with the choice of charity, we create a panel in which each observation is an individual's decision of whether or not to select a particular charity; thus, each subject has ten observations, one for each charity. The dependent variable is an indicator that equals one when that charity is selected by the subject. Each observation also includes the quality information seen by that subject regarding that charity, as well as the charity's type. We include individual subject fixed effects in an OLS regression, which subsume the treatment that the subject faced, as well as any other factors that are invariant within a subject.

[9] 21 observations are lost due to ambiguous survey responses about where the subjects lived. Omitting the Texas variable and including this 21 observations does not significantly alter results.

Figure 3.4: Distribution of Charities Selected

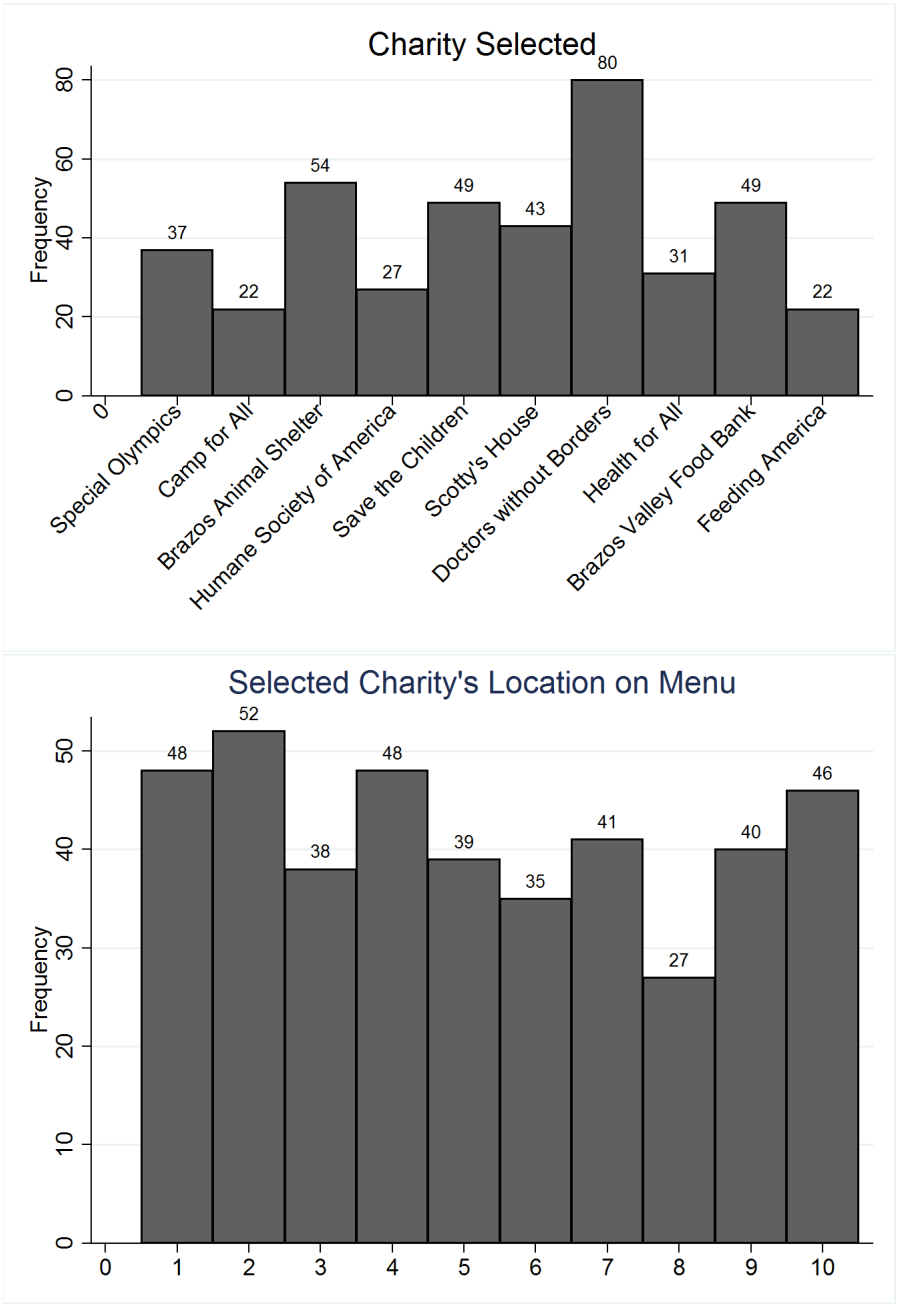


Table 3.2: Local Charity Choice

		Coefficient	**Standard Error**
Charity Type	Animal	0.285***	0.086
	Children	0.087	0.085
	Health	-0.086	0.083
	Food Security	0.317***	0.088
Class	Sophomore	0.010	0.143
	Junior	0.005	0.139
	Senior	-0.018	0.137
	Grad Student	-0.080	0.170
Race	African-American	0.071	0.156
	Hispanic	0.038	0.104
	White	0.050	0.084
	Other/Multiple	-0.045	0.124
	Female	0.018	0.052
	Texan	0.008	0.073
	Econ/Business Major	-0.039	0.054
	Works for Pay	0.032	0.050
	Volunteers Regularly	-0.003	0.053

$^{*}p < .05$,** $p < .01$,*** $p < .001$
Also included: treatment indicators; N = 393

Column (1) of Table 3.3 shows the effects of a charity being positively rated, as well as whether it is a local charity. Note that if subjects are choosing charities at random, each charity has a 10% chance of being chosen. Therefore, the effect of a positive rating is quite large at 3.4 percentage points; it is statistically significant at $p = 0.008$.[10] However, there is no "local charity" effect – that indicator is small and statistically insignificant. We next include an indicator for whether the subject had

[10]Since the quality indicators are not truly randomly assigned, it is possible that better-known charities are more highly rated and that the effects seen in Table 3.3 reflect, in essence, a "brand" effect rather than a true effect of ratings. Including controls for the actual charity makes it impossible to examine location effects. However, when we examine the effects of ratings including charity effects, the coefficient is positive and relatively large at 0.021, but is significant only at p = 0.15. The small amount of variation within each charity is the likely driver of this relative lack of precision.

Table 3.3: Charity Choice

	(1)	(2)	(3)
Rated Charity	0.0343**	0.0231*	0.0258
	(0.0130)	(0.0124)	(0.0174)
Local Charity	0.0017	0.0146	0.0172
	(0.0101)	(0.0100)	(0.0162)
Rated∗Local Charity	.	.	-0.0050
	.	.	(0.0230)
Charity Experience	.	0.1691***	0.1629***
	.	(0.0108)	(0.0109)
N	4140	4140	4140
adj. R^2	0.005	0.048	0.049

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Each regression includes subject fixed effects (which subsume treatment effects) and the charity's type. Standard errors clustered at the subject level are in parentheses.

experience with that particular charity.[11] The effect of experience with the charity is large and significant and reduces the size of the rating effect to 0.023 (s.e. = 0.012), which is still statistically significant at $p = 0.063$. This indicator controls in part for the general prominence of the charity; to the extent that this is correlated with its rating, including the experience variable yields a more accurate estimate of ratings.

Finally, in Column (3), we add an interaction between charity rating and local charity to determine if preferences for a local charity are revealed when that charity is positively rated. This interaction is quite small and statistically insignificant, suggesting that the addition of ratings do not reveal preferences for local charities. The overall marginal effect of charity rating in this specification is 0.023 (s.e. = 0.012), significant at p = 0.060; the overall marginal effect for a local charity is 0.015

[11]Subjects were asked after the experiment if they had no knowledge of the charity; had heard of it but were unfamiliar with it; were very familiar but had never donated or volunteered; or had donated to or volunteered for that charity. The indicator equals one if subjects were very familiar or had donated to the charity. Results using the full set of categories are similar, with greater familiarity exerting a stronger effect on choice.

Table 3.4: Percent Donated

	(1)	(2)	(3)
Rated Charity	0.0882	0.0724	0.0641
	(0.0867)	(0.0510)	(0.0397)
Local Charity	0.0865	0.0414	0.0448
	(0.0600)	(0.0361)	(0.0276)
N	414	259	414
adj. R^2	0.139	0.112	–

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Each regression includes treatment and charity type (e.g., animal, special needs) effects. Standard errors in parentheses. Standard errors are in parentheses.

(s.e. $= 0.010$).[12]

3.3.2 Donative Behavior

Understanding which charity a subject selects is only part of understanding the relationship between social distance, third-party information, and donor behavior. As illustrated above, third-party quality information does affect charity choice, while social distance does not; however, they may affect contribution behavior differently. It is important to note that charity choice is endogenous in this framework. An "ideal" experiment might randomly assign the charities to each subject (along with ratings) and then investigate the effects of rating and location on giving. We recognize that charity choice is endogenous and that these results may reflect the behavior of the *type* of individual who selects a highly-rated or local charity. Investigating these effects, with the appropriate caveats, is still instructive.

In Table 3.4, we present the results on the percent of earnings given. 62.6% of subjects make a donation. Conditional on donating, the mean percent of earnings

[12]Separately, an interaction for rating with the experience dummy is small at -0.007 and statistically insignificant.

donated is 23.0% (the unconditional median is 3.7% and the conditional median is 15.5%). Each specification includes controls for the treatment, both in terms of whether quality information is provided and the method of donation as described in Section 3.2 and Brown et al. [2013b]. We employ a two-part hurdle model [Meer, 2011a, Huck and Rasul, 2011] in which the decision of whether or not to give is modeled with a probit. Column (1) of Table 3.4 shows the marginal effects from this specification, including controls for the treatment and charity type. Neither the rating of the chosen charity nor whether it is local is statistically significant, though the effects are fairly large for each variable – nearly nine percentage points on a baseline of about 63%. Turning to Column (2), we examine the effects on the percent donated conditional on making a donation, using OLS on the observations with positive giving. Again, the effects are statistically insignificant but fairly large, with the coefficient on charity rating increasing the percentage given by about one-quarter relative to the baseline.

Given these results, it is straightforward to compute the marginal effects on the unconditional percent given, which we show in Column (3). The combination of the effects from the extensive and intensive margins yields an overall effect of choosing a rated charity of 6.4 percentage points on percent given, statistically significant at $p = 0.106$.[13] Choosing a local charity increases the percent given by 4.5 percentage points, statistically significant at $p = 0.101$.[14]

[13]As discussed in Section 3.3.1, it is not possible to include charity effects and examine the effect of location. However, in specifications similar to those in Table 3.4, but including a full set of charity effects and excluding the indicator for local charity, the general pattern of results is similar. Some precision is lost, though. Controlling for the actual charity selected may come closer to the causal impact of ratings, since the identification is arising from whether the subject was randomly assigned to receive rating information or not; however, their choice of charity may still be affected by these ratings.

[14]Similar to Table 3.3, we also test specifications that include the experience indicator, as well as an interaction between rated charity and local charity, being careful to account for the nonlinearity of the model. In each case, the results are similar: both charity rating and local charity have large effects. The interaction term is imprecisely estimated, but positive.

Overall, we take these results as suggestive that charity ratings increase donative behavior. Nevertheless, we urge caution in their interpretation, as the choice of charity is endogenous.

3.4 Discussion

Selecting a charity can be a difficult decision; there are numerous charities which provide similar services. In our laboratory experiment, subjects choose from a list of ten charities knowing that they will have the option to donate some of their earnings to this charity. In this selection stage, we vary the information about the charities. Specifically, we have a baseline where there are no third-party assessments of the charities and treatments where these quality metrics are freely given.

Our results suggest that these ratings matter in selecting a charity. While ratings seem to increase giving, the effects are less precise and, since the choice of charity is endogenous, difficult to interpret causally. We also examine whether subjects have a preference for local charities. We find no strong preferences for local charities over non-local ones, and these preferences are not affected by ratings. This result provides evidence against the explanation that individuals prefer local charities but give nationally because those charities are more reputable.

A related question regarding social distance that has yet to be assessed concerns the distinction between local provision of goods and local providers of goods. Would donors rather give to an institution based non-locally but which provided services in the area instead of a local charity run by members of the community that helped those outside the community? Our future work will focus on this question.

4. DEBT AND (FUTURE) TAXES: FINANCING INTERGENERATIONAL PUBLIC GOODS

To some degree, each generation inherits their economic climate and its influence on current and future economic activity. Generations begin with resources (e.g. a potential economic frontier) which are due, in large part, to the choices made by the generation(s) which came before them. Many factors that influence the wealth of entire generations are the public investment choices of the previous generation(s). These investments include pollution and environmental quality, establishing and supporting a court system, infrastructure, the development of knowledge/science, and a plethora of other potential societal investments [Devarajan et al., 1996, North, 1989, Grier and Tullock, 1989]. For example, work done by NASA created new technological growth as well as increased our understanding of astronomy and theoretical physics.[1] This paper considers these public goods, whose impact extends beyond the current generation. In this paper, I use a laboratory experiment with intergenerational public goods to capture how one generation influences the economic environment of the next. In this experiment, I have two treatments – one where debt can be used to help invest in the public good and one where debt is not available. In this way, I test how public debt and private saving between individuals across generations impact future agents' welfare.

I design an experiment in which individuals are members of a group. Each of the groups can be thought of as a generation in a lineage of generations. The current generation's investment in a public good indirectly determines both their payoffs

[1]Light-emitting diodes (LED) were developed to grow plants in space. Aircraft anti-icing systems were pioneered by NASA. Many structural analysis software programs that have since been used by car manufacturers and designers of roller coasters were developed by NASA scientists.

and the starting endowments/wages of the next generation. I observe that subjects, on average, consider the impact of their actions on future subjects (generations). Nevertheless, debt negatively impacts future players economic environment. Further, I decompose this impact into separate causes: relative underinvestment in the public good and insufficient savings for the next generation. Interestingly enough, the use of debt comes with benefits; the debt slightly increases contributions to the public good and increases the savings from one generation to the next. Nonetheless, these gains for the next generation are not enough to overcome the negative impact of debt repayment by future individuals.

I specifically study a public goods environment because most large investments made by societies have elements of public goods. For example, consider a large government research grant that creates knowledge which, once discovered, is non-rivalrous and non-excludable. This knowledge changes not just the groups who discovered it, but also alters the state of the world for future individuals; their production possibility frontier is expanded. Thus, society's investment into these types of public goods helps the current generation and can lead to further gains for future generations.[2] These large undertakings are normally group decisions, further increasing the appeal of studying these types of investment decisions in a public goods setting.

Investments into group projects, however, face many obstacles; the free-rider problem is likely the most studied and important in economics. The free-rider problem captures the idea that an individual's optimal choice is likely counter to the socially optimal. Nevertheless, Fischer et al. [2004] use an experiment to illustrate that if the group's actions alter future individuals' welfare, then current decision

[2]Similarly, investments in higher environmental quality make healthier, future workers. This investment increases their productivity further improves output, increasing either current or future consumption and thus welfare. See Isen et al. [2013] for empirical evidence.

makers behave less selfishly; actions are closer to Pareto optimal than without the intergenerational linkages in their common pool resource environment.

This paper, to the best of my knowledge, is the first paper to investigate intergenerational linkages in a public goods setting where the actions of one group impact a future group's economic well-being. My experimental design also allows for the possibility of infinite generations in a dynasty as each generation has a known and constant probability of being the last one. As my experiment considers intergenerational debt and private savings between generations, the results of the experiment add to lineage of papers concerned with Ricardian Equivalence [Barro, 1974]. This research helps inform discussions regarding public projects, growth theory, and debt versus tax financing of various government projects.

In Section 4.1, I discuss the related literature. Section 4.2 details the theoretical background and predicts agent choices in those environments. I discuss the experimental design used to investigate intergenerational public goods games in Section 4.3. Section 4.4 provides the results of the experiment and in Section 4.5 I discuss implications of those results on public policy and potential extensions to my work.

4.1 Literature Review

There is rich history of studying public goods in an experimental laboratory. Much of the literature focuses on the impacts group size, returns from contributions, number of repetitions, and heterogeneity of endowments on subject behavior. For an extensive literature review of early work see Ledyard [1995]; Zelmer [2003] provides a meta-analysis of linear public goods.

A recent addition to the public goods literature are experimental studies of dynamic public goods. Noussair and Soo [2008] study a public goods game where members of a group can influence their own future marginal per capita return (MPCR).

They find that in this environment, contributions do not, on average, decline consistently over time as the future payoff from the public good is a function of current contributions to it. This result is counter to standard, repeated public goods findings in which contributions approach zero over time [Ledyard, 1995]. Cadigan et al. [2011] study a two period public goods problem in which the outcome of the first period determines the state of the world in the second period; subjects play the second period public goods game with their earnings from the first period. This carryover leads to increased contributions, in general, in the first of the two periods. There is not, however, significantly increased efficiency overall compared to a two-period public goods setting without carryover.

A related line of literature is recent experimental investigations on intergenerational common pool resources (CPR). The tragedy of the commons plagues CPR similarly to the way the free-rider problem hampers efficient provision in a public goods environment; each agent encounters the trade-off between personal versus group payoff maximization. Chermak and Krause [2002] use a overlapping generations environment to investigate which observable characteristics identify various types of players (conditionally cooperative, Nash/selfish, *etc.*) in the CPR setting. They find that roughly one-fifth of subjects consistently employed the socially optimal, altruistic action.

Fischer et al. [2004] conduct an intergenerational CPR experiment whose design is most closely related to mine. In their paper, subjects are in groups of three and play the game only once, knowing that they are part of a lineage of fixed length; the subjects do not know where in that lineage they lie. Fischer et al. [2004] find that the intergenerational linkage does alter behavior from standard CPR experiments as consumption of the common pool resource slows; it does not, however, slow enough to reach the socially optimal level. One might conjecture from this outcome that

similarly more pro-social behavior (increased contributions and higher net savings) could exist in an intergenerational public goods environment.

In addition to public goods, my environment includes intergenerational debt and savings. These two components are often studied in macroeconomics. Barro [1974] discusses a model in which debt is neutral (i.e., does not impact consumption of current and future generations); this model is known as Ricardian Equivalence. The crux of the model is that individuals care about their children, and increase savings for their children to offset the encumbrance of debt repayment; this bequest level ensures their children do not bear the burden of those encumbrances. This model has mixed empirical evidence using field data [Bernheim, 1987, Seater, 1993, Stanley, 1998].

There is a growing literature of experimental macroeconomics. Duffy [2008] provides an overview of this literature. Within this literature, there is a subset of papers which investigate aspects of Ricardian Equivalence. Cadsby and Frank [1991] provide the first experimental test of intergenerational Ricardian Equivalence in their two period, two agent model of government debt and savings. They find, for the most part, individuals' savings are enough to offset future debt repayments. In further studies, Slate et al. [1995] and DeLaurea and Ricciuti [2003] each find that savings behavior is sensitive to the level of certainty in the economy. In each of these studies, debt is exogenously imposed and cannot be leveraged to produce anything of value for future players. Further, all these Ricardian Equivalence experiments monetarily induce subjects to care about the other (future) player in the room. My research diverges from those paper on both of these issues and will be further discussed in the Section 4.3 on the design of the experiment.

4.2 Theory

I begin by examining a classic public goods situation depicted in Equation 4.1. Agents are members of a group of size N; each group plays a version of the voluntary contribution mechanism. I consider the standard linear public goods environment. The selfish, Nash equilibrium is zero contribution by all agents. Conversely, the Pareto optimal solution is full contribution by all N members of the group. This environment is modeled by

$$\pi_i = w_i - g_i + \gamma \sum_{j=1}^{N} g_j \tag{4.1}$$

where π_i is the payoff to i, w_i is the endowment of agent i, and g_i is the contribution to the public good by agent i. The marginal return per capita, γ is less than one and $N\gamma > 1$; if all N group members contribute then payoffs are higher than if they all do not contribute. Any γ with those criteria allows for the classic free-rider problem discussed in public goods literature. The models predictions for Nash and socially optimal play are $g^{NE} = 0$ and $g^{SO} = w_i$ for all i, respectively.

Importantly, the contribution to the public good by an agent not only has positive externalities for her contemporaneous agents, but also a positive spillovers on future agents. I present a Nash dynamic model, an intragenerational optimal set of actions, and the dynamic socially optimal solutions below.

I assume that endowments w_{it} evolve in the following way

$$w_{it+1} = w_{it} + \theta(G - Nw_{it}\alpha) \tag{4.2}$$

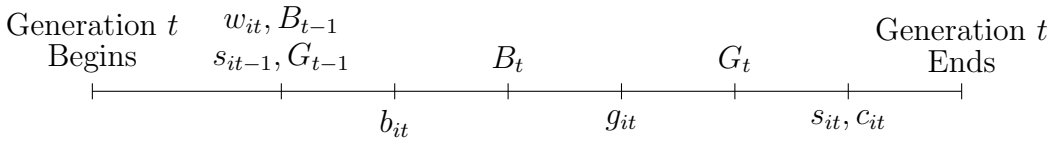
where $\alpha < 1$ and $G \equiv \sum_{i=1}^{N} g_i$, the sum of all agents' contributions. One can think of $Nw_{it}\alpha$ as a public goods threshold. Investments under the thresholds lower the

next generation's starting wealth whereas investments over the threshold increase it. The parameter θ can be thought of as an intergenerational marginal per capital return from investment into the public good. Because I consider positive spillovers from investment in this paper, it is necessarily the case the $\theta > 0$. It is important to note that both $w_{it=1}$ and $w_{jt=1}$ are monotonically increasing in g_{it}; the spillovers are public goods for the future agents.

The other two way agents influence future agents is through borrowing and saving across generations. Savings choices are made at the end of an agent's life and she can save any amount between nothing and her current resources. This savings s_{it} is passed directly to her heir, s_{it+1} where agent it can be thought of as the t^{th} member in family i's lineage.

Conversely, members in generation t can lower the resources available for those in generation $t+1$. This reallocation is done via public debt. Public debt is not an individual choice; each member of generation t submits their choice b_{it} for their preferred debt. The amount of debt a player wishes to borrow from the next generation must follow $b_{it} \in [0, \delta w_{it}]$ where δ is a constant and represents a borrowing limit as a function of the endowment. I assume that agents have single-peaked preferences over the level of debt used B_t. Further, there is a voting mechanism that maps the vector of $b_{it} \rightarrow B_t$. Given the single-peakedness of preferences, I assume that the mechanism which maps agents' preferences over debt to the realized debt is the median voter mechanism. All agents submit b_{it} and the median submission becomes B_t.

Each agent lives once and so plays the game once. They know that their heirs can receive the impact of these contributions (Equation 4.2). The timeline of the agent's actions are seen below.



where B_t and s_{it} are the borrowing and savings of agent i in generation t, respectively and b_{it} is the vote for the amount generation t should borrow from generation $t+1$. There is never more than one generation of decision makers at a time, but agents can observe the actions of the previous generation and their own income before making any choices. Items on the top of the timeline are information that is gathered by the agents before making the next set of choices. Choice variables are located below the timeline. For instance, before determining the amount of savings, subjects observe the group contribution G_t even though it is not a choice variable.

As illustrated in the timeline, agents can borrow against their heirs' endowment to help fund their contribution and consumption.[3] This detail is a normalization which captures that debt financing leads to higher taxes being issued on future players for debt repayment. I assume that there is a limit δw_{it} with $\delta < 1$ that player i can attempt to withdraw from her heir's endowment. This modified public good setting setting becomes

$$\pi_{it} = \underbrace{w_{it} - B_{t-1} + s_{it-1}}_{\text{Net Starting Endowment}} - \overbrace{(s_{it} - B_t)}^{\text{Net Savings for Next Gen.}} \underbrace{- g_{it} + \gamma \sum_{j=1}^{N} g_{jt}}_{\text{PG Game}} \tag{4.3}$$

where B_t and s_{it} are the amounts borrowed and saved by agent i in period t, respectively. Agents are connected to a specific agent before and after them. All savings choices from t to $t+1$ are from one agent to another, specific agent. In this way, one can consider each agent to be in a familial lineage where savings are for her

[3] I assume there is no population growth in this environment.

progeny. Conversely, the debt B_t is a determined by the group and the burden of debt repayment is shared equally by all agents in all families. The agent's savings decision is an individual choice and impacts only the player making that choice and her direct heir, irrespective of what the other members of her group choose to save.

4.2.1 Nash Equilibrium

In this more expanded environment there is a profile of actions which constitute a Nash Equilibrium. This profile is $g^{NE} = 0$, $b^{NE} = \delta w_{it}$, and $s^{NE} = 0$. Note, this strategy severely hurts future generations of agents. Note only do incomes fall by $(1-\alpha)\theta$ each generation, but endowments are additionally suppressed by δw_{it} which falls over time as w does. This baseline of the Nash equilibrium indicates that private transfers between generations (debt and savings) could lead to a collapsing outcome in which all players are worse than those before them. If players, however, have any of a variety of other-regarding preferences, it is not necessarily the case that such devolution to the worst outcome will happen.

4.2.2 Social Planner/Intergenerational Optimality

Consider an agent who considers the benefits of her contribution to the group (both present and future groups) and wishes that everyone's payoff is maximized. This agent's preferences are those of an objective social planner who wishes to maximize $\sum_N \sum_T \pi_{it}$. As in the situation where an agent only cares about contemporaneous agents, she would borrow everything she could and invest it. So once again, $b_{it} = \delta w_{it}$ and $g_{it} = (1+\delta)w_{it}$ for all i and t. The primary deviation is that optimal actions require than the agent care about future agents and must therefore save properly for them. She solves

$$\max_{s_t} \sum_{t=0}^{\infty} \beta^t \left[U \left(\gamma \left[(1+\delta) w_t - \delta w_{t-1} + s_{t-1} \right] - s_t \right) \right] \tag{4.4}$$

subject to

$$\gamma \left[(1+\delta) w_t - \delta w_{t-1} + s_{t-1} \right] \geq s_t \tag{4.5}$$

Solving the equation yields the socially optimal action. The first order condition for s_t yields $U_t^{'} + \lambda_t = \beta\gamma U_{t+1}^{'} - \gamma\lambda_{t+1}$; this outcome is to be expected in a dynamic model with intergenerational preferences. Because the resource constraint will only bind at $t = \infty$ due to the transversality condition, it is the case the $\lambda_t = 0$ for all $t < \infty$. Therefore, the Euler equation simplifies to $U_t^{'} = \beta\gamma U_{t+1}^{'}$; savings are set to make the marginal utility of any period equal to the discounted marginal utility of future periods with the returns to savings γ considered.

Note that a special type of other-regarding preferences could exist. Perhaps agents only care about their own cohort and completely discount their progeny. Agents who only care about their own generation have no reason to save and every reason to borrow. Each token an agent borrows is one more token that can be invested in the public good; this investment helps every member of her generation. Assuming that her and members of her cohort's generations consumption is all that enter her utility function (i.e., $U(c_{it}, c_{js})$ for all $t = s$ and $i \neq j$) and that her utility is increasing in the consumption of her peers, then she will choice to borrow all that she can ($b_{it} = \delta w_{it}$) and invest all of it ($g_{it} = (1+\delta) w_{it}$). Because her utility function does not include future players' consumption, saving for those agents offer her no benefit and appropriately chooses $s_{it} = 0$. This style of preference is consistent with the moral hazard argument of debt-financing public goods, as the agents who are benefiting from the debt are not being forced to pay the cost and are also not choosing to aid those who are paying the cost.

4.3 Experimental Design

Experiments were conducted in the Economic Research Laboratory at Texas A&M University using undergraduate students who were recruited using ORSEE [Greiner, 2004]. Sessions were conducted in the summer of 2013. Session had between ten and twenty subjects each and all lasted less than two hours. Experiments were conducted using zTree [Fischbacher, 2007].

Subjects were brought into the lab and assigned a seat. Each seat corresponded to membership in a particular lineage. Once seated, subjects were given a set of instructions detailing the game environment and the structure of their possible actions. Subjects then took a quiz to ensure they understood the structure of the experiment and the outcomes of various actions. The results of the quiz did not influence payments and all subjects were required to answer every questions correctly before the experiment would begin. If a subject answered a question incorrectly, a message would appear on her screen explaining why she missed it along with the correct answer. I used the quiz to reinforce the important aspects of the game for all the subjects and to ensure they understood how each choice impacted their and others' payoffs. Once all participants answered every question correctly on the quiz and all questions regarding the experiment were answered, subjects proceeded to the play the game.

Subjects played the same game for ten rounds. One of the rounds was selected for payment. In the nine rounds not selected for payment, subjects were given randomly generated starting values drawn from the distribution around the actual round. This design allows me to test for intergenerational reciprocity. To help keep each round as independent as possible, minimal feasible feedback was given to the subjects; I further discuss methodological choices in the sections below. Each round had multiple

stages: debt voting (treatment only), public goods investment, and savings choices. I will discuss each of these stages individually and then how they piece together to determine payment for subjects. For both the control and treatment, subjects were randomly assigned to groups of five. Subjects played the game with tokens; each token was worth twenty cents and was converted to US dollars at the conclusion of the experimental session.

Subjects were told that there was a sixty percent chance that the choices they were making would impact a future set of Aggies (Texas A&M students). This continuation probability was chosen for two reasons. First, I consider generational choices and therefore need an appropriate discount rate for a generation. Taking a relatively conservative annual discount rate of 0.98 to the twenty-fifth power yields approximately 0.60. Second, it yields a continuation probability of greater than one-half, which is likely focal for subjects when considering their impact on others. Because of this continuation probability, it is possible to have an infinite string of generations. To increase the feelings of empathy for the next generation, the instructions and decision screens made reference to Texas A&M.[4]

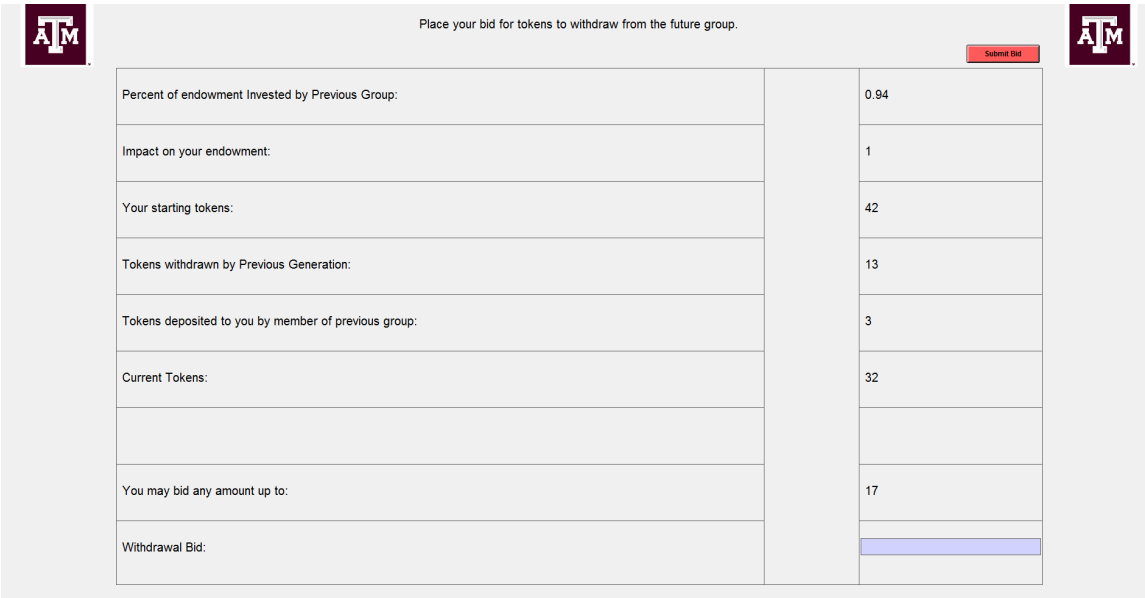
4.3.1 Debt Voting Stage (Treatment Only)

Subjects in the treatment had the option to use future players' tokens for their own investment of consumption. To capture group debt-financing, debt creation and its level are determined by the subjects; they were asked to place a bid to *withdraw* tokens from a future player's set of tokens. Each subject submitted their

[4]Members of Texas A&M, known more generally as *Aggies* have large amounts of school and communal spirit. There are numerous traditions at Texas A&M, many of which focus on aiding or showing support for other Aggies. In this way, I believe I can harness the naturally existing connection between the subjects to induce intergenerational preferences, rather than monetarily do so.

bid simultaneously knowing that the median bid would be used.[5] The selected bid was then added to each players tokens. For example, subjects' bids of 5, 6, 9, 12, and 19 yield 9 as the winning bid and all subjects have nine tokens added to their current available tokens. Correspondingly, future subjects would have nine tokens removed from their starting endowment capturing lump-sum taxes to repay the debt. For simplicity, there is no interest on debt.

Figure 4.1: Screen Shot of Debt Voting Stage in Treatment



Subjects were also given information about past play. I gave subjects this information to see how reciprocity might influence their actions. They were told the amount withdrawn and deposited by previous players as well as those players' group's investment in the public good and how it impacted them. The debt limit used for

[5]Groups can achieve no debt by having three or more members select zero as their debt withdrawal bid.

the experiment was 40% of the subject's starting tokens.

4.3.2 Public Goods Investment

The next stage (which is the first stage for the control) is the public goods game. Subjects were told their current amount of tokens (net starting plus withdrawals, when applicable). Once again, subjects could see past play and how it impacted them when making the contribution decision. A subject could invest any amount of tokens she wanted (i.e., zero to her current tokens) into the public good. The intragenerational marginal per capita return (MPCR) on investment was 0.3.[6]

The intergenerational MPCR spillover is 0.08 tokens. That is, each token that a subject invested would raise the starting balance of the tokens for each player in the next generation by .08 tokens; the impact from investment in monotonically increasing for the next generations' starting tokens. To capture the idea that there can be insufficient investment in public goods, subjects had a threshold where the spillover would go from negative to positive. For saliency I used fifty percent of starting tokens. This is also corresponds nicely with most work on linear public goods environments which find contributions of either one-shot or first rounds of repeated games to have contributions between forty and sixty percent [Ledyard, 1995]. [7] Subjects were told that each token under half of the token endowment would lower a future Aggie's starting tokens by .08 and for each token above their starting tokens would increase by .08 tokens.

All choices were made simultaneously in each of the rounds and a screen shot can be found in the Appendix.

[6]Subjects were told all tokens invested were multiplied by 1.5 and divided back out equally.

[7]One can think of this threshold as 50% of GDP needs to be invested into this public good to break even on the impact for the next generation. Though that percentage is may be too high, fifty was selected because it is focal and salient. Currently the United States has 38.9 percent of its GDP come via government expenditure (2011 Index of Economic Freedom, Wall Street Journal). Not all of these government expenditures are necessarily invested in public goods.

4.3.3 Savings Choices

Subjects made savings choices after the public goods game. To ensure that a subject could not update on how selfish or altruistic her group members were, she was given five possible outcomes from the public goods game. One of these outcomes was real and the other four were randomly determined conditional the subject's own contribution.[8] This process has an additional benefit beyond allowing for multiple rounds — it also provides another set of counterfactuals within a subject and a round. An example screenshot can be seen in Figure 4.2.

For each possible group contribution amount, subjects were told how it impacted the next group, what their current tokens were at that time, and what the next person's tokens would be before any *deposits* to their account. By giving the subjects all of this information I can test if subjects decided to save just enough so that the next generation is no worse off than they were (net impact), if they have a minimum threshold of tokens they wish to keep, or employ other behavioral heuristics.

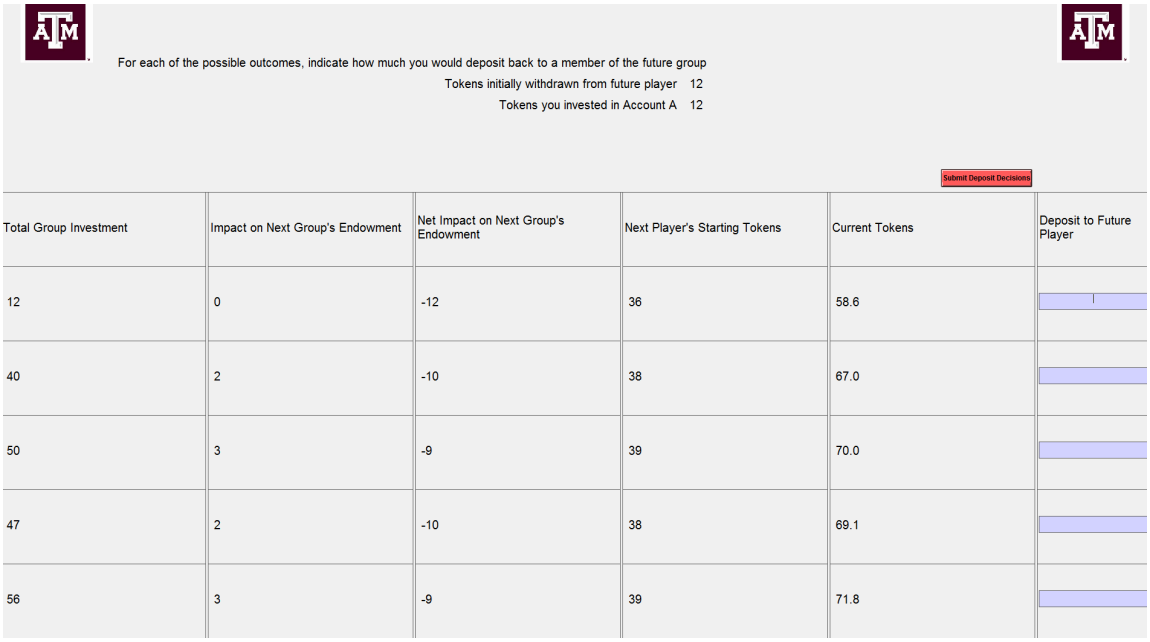
4.4 Results

I find that the availability of debt hurts the next generation, on average, by two tokens whereas the counter-factual baseline has a positive impact on the next generation of six tokens. This eight token difference is robust to a variety of empirical controls. Summary statistics can be found in Table 4.1. Figure 4.3 highlights this graphically. Additionally, Figure 4.3 illustrates the average externality from one generation to the next for each of the various channels (debt, savings, spillovers from public goods) for the control and treatment.

The regression analysis yields similar findings to the unconditional data. The

[8]The random number was drawn uniformly from the range of the subject's contribution to the maximum possible conditional on her contribution. This technique was implemented to ensure that numbers on the extremes which would obviously be fake were never shown to subjects.

Figure 4.2: Screen Shot of Savings Choices



availability of debt, on average, leaves subjects about eight tokens worse off compared to the baseline world without debt.

From Table 4.1 and Figure 4.3, we can see that debt leads to larger positive spillovers from one generation to the next (higher investments and savings). These additional gains, however, are more than offset by the existence of debt. This analysis, though interesting, is cursory; information gleaned from Figure 4.3 are unconditional on many factors which could alter play. To control for more details I conduct a regression analysis. I now decompose the treatment effect to investigate the channels by which debt is harming the next generation.

4.4.1 Underinvestment in Public Good

The optimal outcome for both the current and future generation requires that all debt is fully invested in the public good. This action creates the most extra surplus

Table 4.1: Earnings, Investment, and Growth Summary Statistics

	No Debt	With Debt
Subjects	30	30
Earnings	\$17.55	\$18.23
	(\$4.04)	(\$4.71)
Starting Tokens	50.07	49.73
	(12.57)	(12.87)
Previous Generation's Debt	N/A	9.37
		(5.43)
Savings by Previous Player	9.67	9.95
	(6.62)	(6.69)
Tokens Borrowed	N/A	16.1
		(5.29)
Average Contributions	26.91	28.95
	(22.59)	(24.57)
Percent of Tokens Contributed	45.21%	43.14%
	(33.70%)	(31.75%)
Tokens Saved for Next Player	4.4	10.11^{***}
	(7.65)	(12.96)
Total Impact on Next Cohort	6.04	-2.07^{***}
	(9.71)	(15.89)

Standard deviations in parentheses

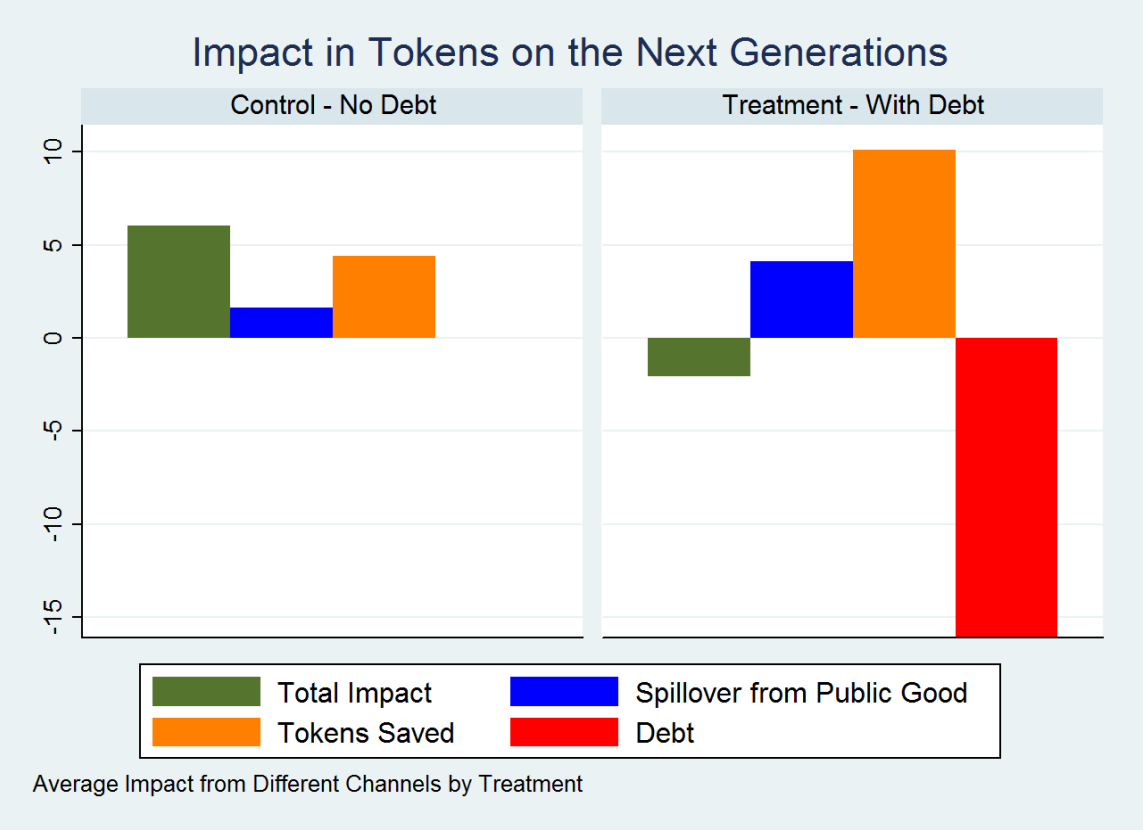
p-values derived from Mann-Whitney rank sum tests.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

for both the current generation and has the largest positive spillover for the next generation. I conduct a regression analysis to test how different characteristics and sources of income impact a subject's investment in the public good. This analysis is only looking at the Debt Treatment, because they are the only subjects with access to debt.

Table 4.3 illustrates the empirical determinants of investment into the public good. The coefficient on debt is roughly one half and is not statistically different from zero even using a one-tailed test at the ten percent significance level. This is evidence that many subjects are not optimally investing the debt they borrow; this

Figure 4.3: Treatment Effect on Various Spillovers



behavior leads to smaller group earnings for their group and the future group which plays after them.

Interestingly, the main force which alters investment in public goods is the net starting tokens of the subjects. Current investments would increase this value, as would higher net savings. This outcome would indicate that higher savings and/or lower debt could offer Pareto improvements to future players. This simple observation regarding how debt and savings may alter investment behavior indicates that examining their relationship is even more important dynamically than just simple transfers between generations.

Table 4.2: Regressions on Impact in Tokens for Next Generation

Debt Treatment	-6.561**	(2.431)	-6.258**	(2.344)
Starting Tokens	-0.00474	(0.0336)	-0.00836	(0.0285)
Previous Debt	-0.189	(0.151)	-0.230	(0.153)
Previous Savings	0.173*	(0.0750)	0.201**	(0.0719)
Constant	7.801**	(2.809)	9.084**	(3.114)
Observations	3000		3000	
Subjects	60		60	
Periods	10		10	
Additional Demographics	No		Yes	
Round Dummies	Yes		Yes	
adj. R^2	0.104		0.129	

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4.4.2 Insufficient Savings

Dynamic optimal play also requires that subjects save to offset the next generation's debt repayment burden. This is related to the notion of Ricardian equivalence Barro [1974]. Ricardian equivalence states that individuals are save for their children to offset the debt burden they will face. Barro uses intergenerational preferences in an overlapping generations model to show how this result would occur. Specifically, parents care about their children; those children in turn care about their own children. These dynastic preferences lead parents to save for their progeny. Parents do not want their children's livelihood to be significantly worsened by debt-repayment because it would hurt themselves. To avoid this they save exactly equal to the debt repayment.

I find savings to be significantly less than this prediction. Figure 4.4 shows the empirical distribution of savings to debt and the Ricardian prediction. The large under-savings are a principal reason the next generation is negatively impacted with

Table 4.3: Determinants of Tokens Invested in the Public Good

Tokens of Debt	0.524	(0.488)	0.527	(0.509)
Net Starting Tokens	0.435**	(0.145)	0.464**	(0.162)
Previous Generation's Percent Invested	2.780	(5.502)	2.987	(5.156)
Female	1.112	(7.271)	1.313	(7.352)
White	4.680	(8.549)	4.625	(8.684)
Texan	4.495	(7.964)	4.658	(8.141)
Voter	3.839	(7.387)	3.912	(7.497)
Econ/Business Major	10.01	(11.38)	9.875	(11.54)
CRT Fail	-1.745	(8.538)	-1.783	(8.672)
Observations	270		270	
Subjects	30		30	
Rounds	10		10	
Round Dummies	No		Yes	
adj. R^2	0.199		0.182	

Standard errors in parentheses, clustered by subject

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

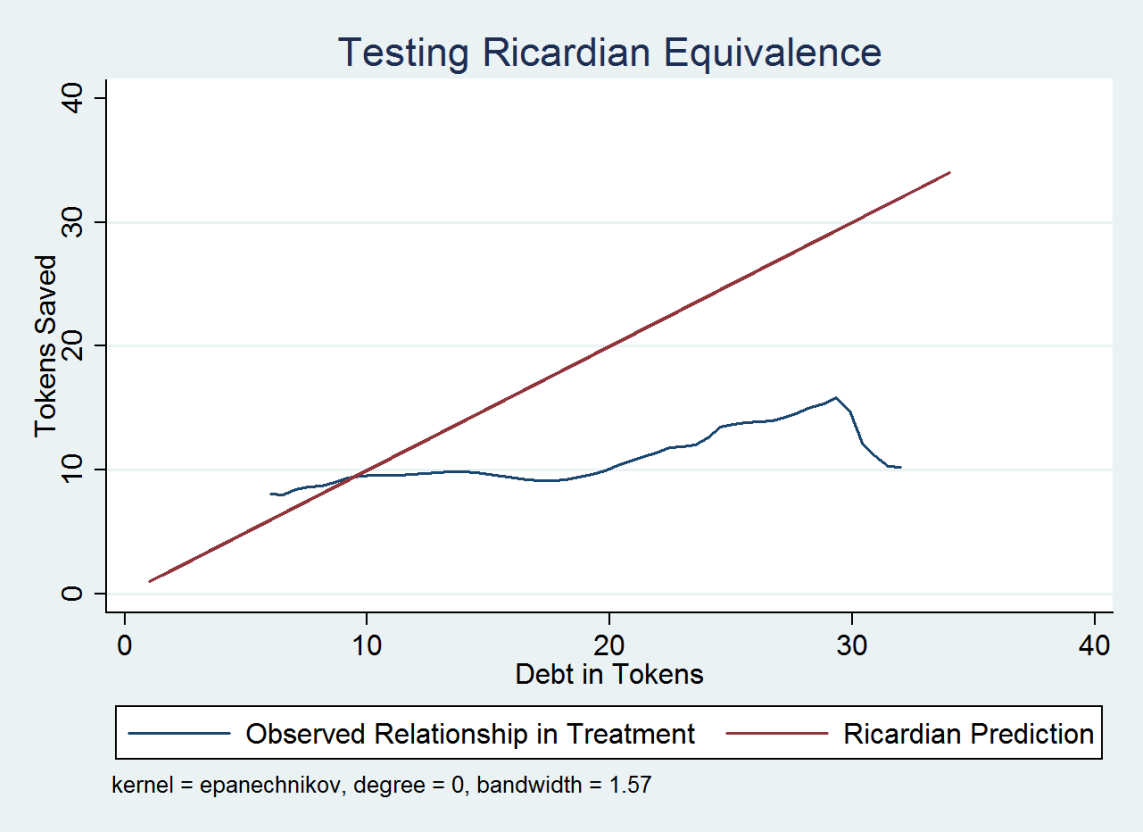
debt. As discussed in in the previous section, it is also the case that this behavior could lead to further suppressing contributions to the public good which would harm long-run growth and future welfare.

Referring to the summary statistics in Table 4.1, the only differences in actions taken by subjects between the treatments is in the savings choices they make. That outcome, combined with the previous discussion of both the importance of net savings impact on future contribution to the public good and the non-observance of Ricardian Equivalence indicates further investigation of savings behavior is order. Table 4.4 includes regression analyses of savings behavior.[9]

The data indicate that a subject's group members' investment increase her own savings decision. This impact is, however, economically small. Consider a group where the other four members each give the observed average number of approx-

[9]The full regression outputs which include the demographic variables are located in the Appendix.

Figure 4.4: Graphical Analysis of Ricardian Equivalence



imately twenty-seven tokens. These contributions would only increase her savings by about two tokens. It is interesting to note that this effect is stronger both statistically and economically in the debt treatment, indicating that cooperative and altruistic group members impact each others' savings choices even more so when the intergenerational moral hazard of debt exists. Additionally, in the debt treatment, the subject's own contributions have a statistically positive impact on her savings choices. This relationship is not present in the debt-free condition.

When analyzing just the debt treatment's data, I find that there is no relationship between the level of debt used by the subjects and the amount they save. This

Table 4.4: OLS Regressions on Tokens Saved by Subjects for Next Generation

	(1) All Data	(2) No Debt	(3) Debt
Debt Treatment	5.346***		
	(1.529)		
Tokens of Debt			-0.033
			(0.181)
Tokens Player Contributed to PG	0.0670*	-0.0150	0.157***
	(0.0291)	(0.0237)	(0.0378)
Tokens Player's Group Contributed to PG	0.0216***	0.0167*	0.0263***
	(0.00508)	(0.00647)	(0.00682)
Constant	8.793**	12.34***	11.25
	(3.153)	(3.074)	(7.570)
Observations	3000	1500	1500
Subjects	60	30	30
Round Dummies	Yes	Yes	Yes
adj. R^2	0.181	0.162	0.200

Standard errors in parentheses, clustered by subject

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

relationship is peculiar, but does seem to confirm what Figure 4.4 displays; there is a savings level that seems to be uncorrelated with the debt in the economy. This behavior exists even when the level debt and its impact on future player is made salient. The subjects directly vote on it and are reminded of the debt both when making the investment decision and once more when making the savings choice. The saliency of debt and its impact on the next set of players should make it more likely that subjects respond to it. Nonetheless, the savings heuristic of subjects in the experiment is not correlated to the group's borrowing. I find, however, that debt, though a fiscal tool which expands the Pareto frontier, faces a strong moral hazard problem even when the outcomes to others are made clear to the decisions makers. It is hard to imagine in a large population setting where the impact is less clear, that agents do not face the same (or stronger) moral hazard incentives.

4.5 Discussion

To my knowledge, this is the first paper which experimental investigates the dynamic impact of public goods in an infinite generations setting in which each generation lives, and therefore plays, only once. I investigate this environment because many public goods are not static in their returns; often the impact of these societal investments, especially large scale ones, have impacts which span generations.

I create a laboratory experiment to test if different methods of financing the public good can impact the welfare of agents dynamically. I observe two, at first, contradictory findings. The ability to borrow leads higher natural endowments for the next generation through higher contributions and corresponding spillovers. When debt is available, the next generation, however, has a lower net endowment (endowment plus savings minus debt repayment) than the generation before them. This lower endowment occurs because the debt repayment is higher than the gains from the previous generation's investment in the public good and their savings. The failings of debt-financed the public goods comes from two separate avenues. Subjects both under invest the debt they get and do not sufficiently save to offset the debt repayment of the future players. The insufficient net savings appears to be the more important aspect, dynamically.

These failings do not mean, however, the debt-financing cannot work and should never be used. This work is simply one attempt to understand this complicated scenario. Within this same design, there are a set of possible extensions which I think are worthwhile. An easy one is varying the marginal returns per capita, both for the current and future players. It is well established within the public economics literature that the higher the MPCR is, the more contributions will be given to the group account [Ledyard, 1995]. Extensions of this type can test the robustness of this paper

in that way. Additionally, different debt limits will likely impact subject behavior. I observe that having access to debt increases savings and (slightly) investment to the public good. By varying the debt limit a fuller relationship between debt-financing and welfare emerges; perhaps the damages from debt are not monotonically increasing in its availability indicating an optimal threshold. Of course, future research can uncover an even deeper relationship between debt and behavior by altering the mechanism and structure of the game. For instance, if the debt, at least in part, was forced to go to the public good would the net investment and savings choices by subjects be altered and how so?

In general I feel that, though the literature on experimental public goods papers is voluminous, there is more that can be added when considering the second-order effects of investments such as this paper does. These above potential extensions and additional tests of other mechanisms will help economists craft better theories and public choice mechanisms over critical policies such as debt-financing — policies that impact both current and future citizens.

5. CONCLUSIONS

Voluntary contributions are an important aspect of our daily lives. Many of us give time, effort, and money voluntarily to others. Most of this occurs because we expect something tangible in return (I give my labor writing this dissertation in hopes of getting a job, etc.) Yet, there are many times when we give to help others without expecting a tangible reward in exchange. As alluded to in Chapter II, charitable giving can is between four and five percent of gross domestic product in the United States — no small amount. A few of these situations were the focus on this dissertation.

While we have uncovered many interesting aspects about individual behavior in these situations, there is still much to be done. For instance, why is giving time and effort more preferred than giving money — even at an efficiency loss? Social distance doesn't seem to be important for charity selection, but this doesn't address a question of if individuals would rather give to a local charity who provides services elsewhere (mission trips in many churches which travel abroad) or to an established charity already located elsewhere. These are ongoing research areas in charitable giving which build upon the research found in this dissertation.

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APPENDIX A

ADDITIONAL FIGURES

Figure A-1: Percent Given by Condition

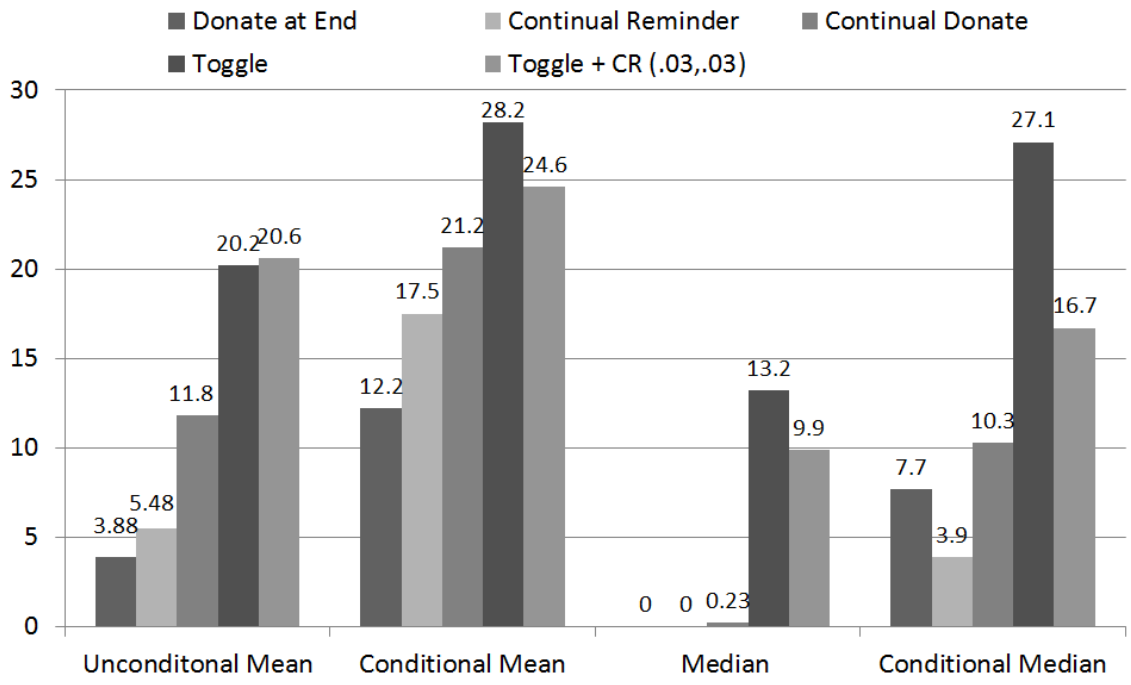

Figure A-2: Dollars Donated above Various Thresholds by Treatment in Toggle + Continual Reminder

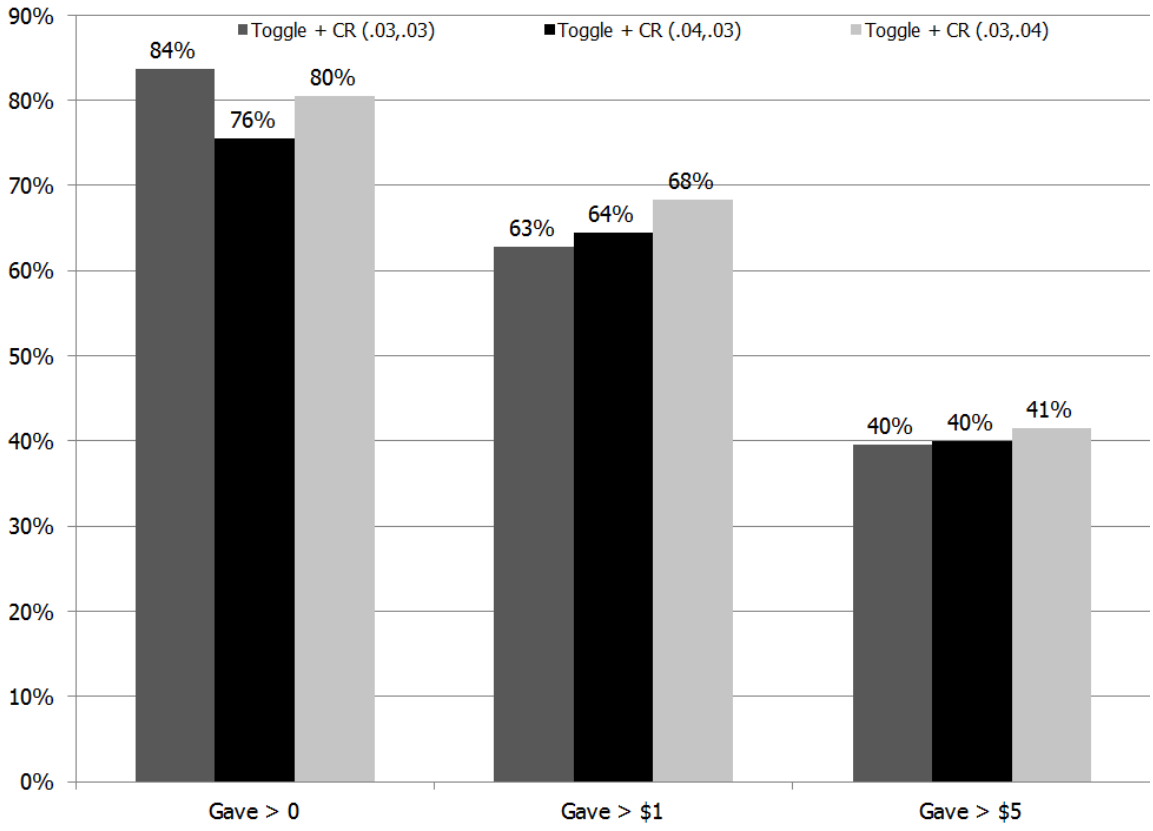

Figure A-3: Graphical Display of Giving Statistics in Toggle+CR

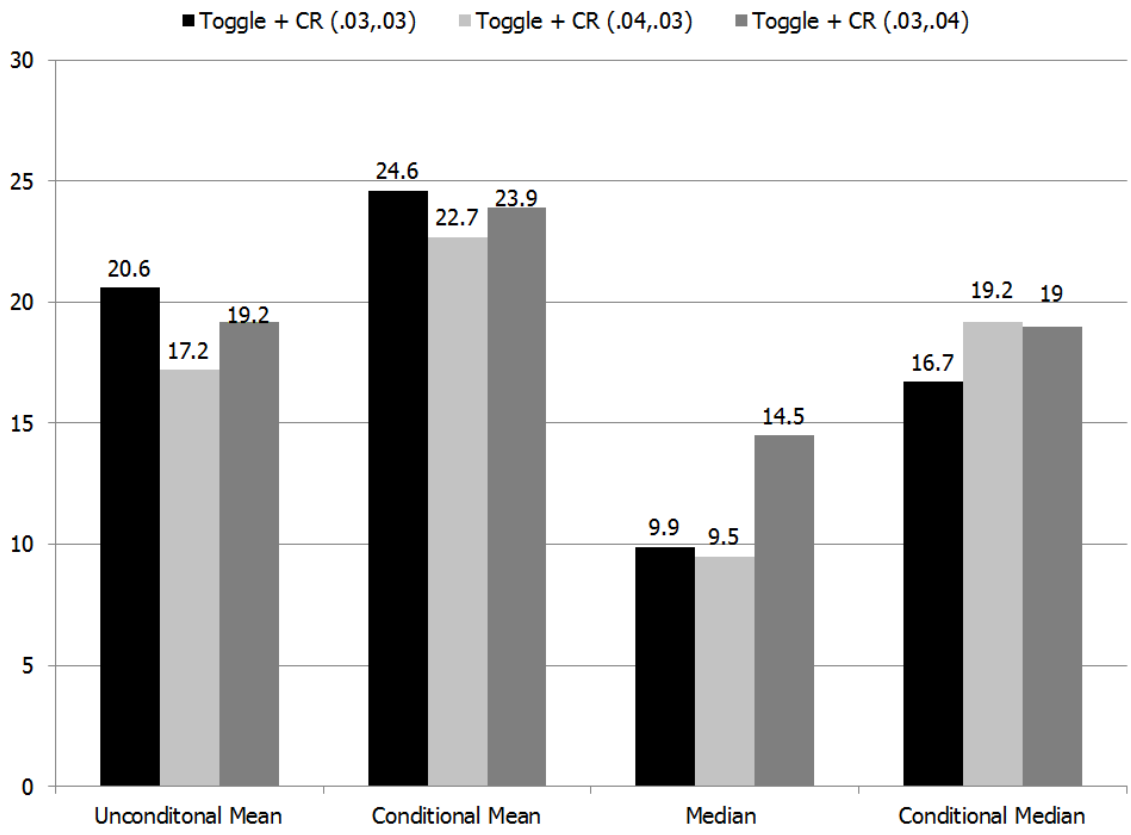

Figure A-4: Breakdown of Donative Activity by Source of Gift

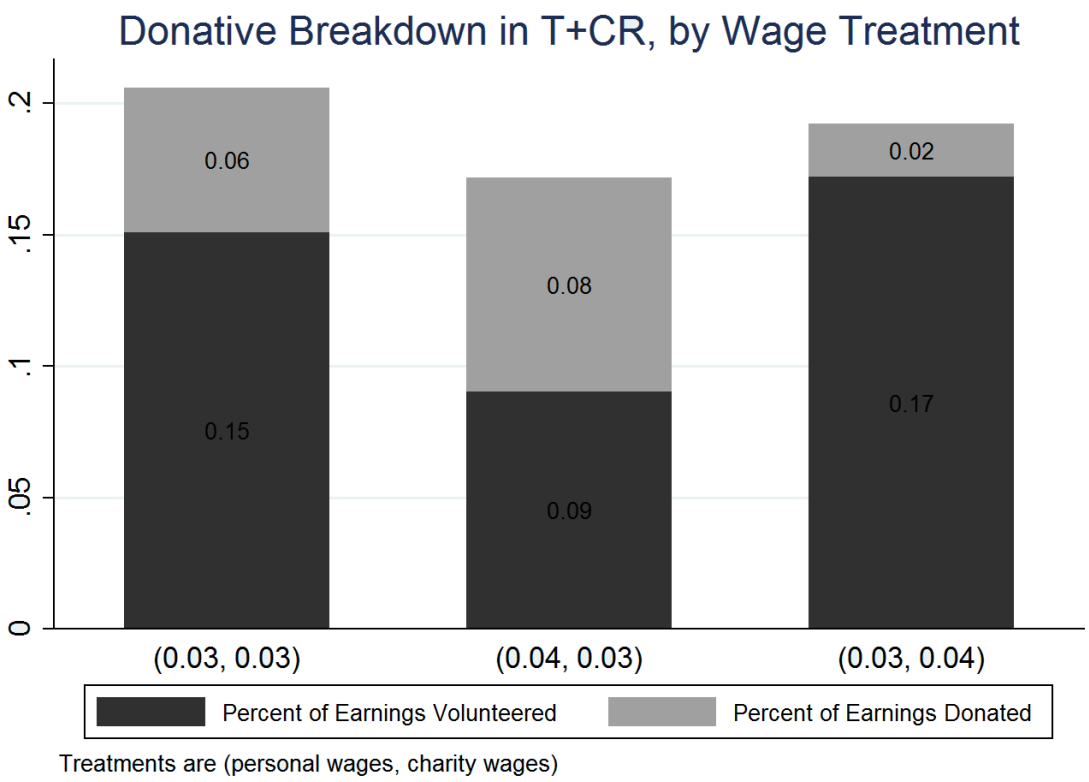

Figure A-5: CDF of Dollars Donated by Minute in T, CD, and $T + CR_{3/3}$